THE

# JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXVI. No. 898.] LONDON, JULY 27, 1880. [32ND YEAR. Price 6d.

**GAS PURIFICATION**
BY
**OXIDE OF IRON.**

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From ½ to 40 H.P. ind.
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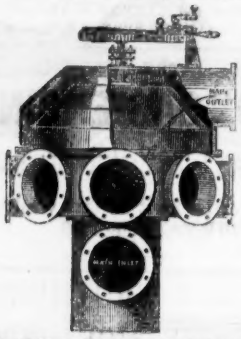
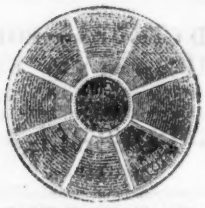
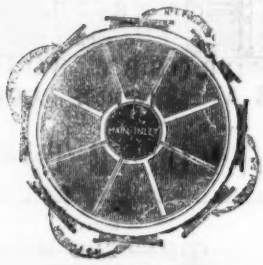


ELEVATION OF THE CENTRE-VALVE.



PLAN OF THE VALVE.



PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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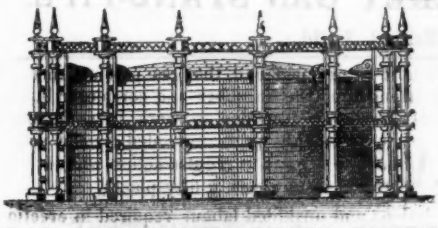

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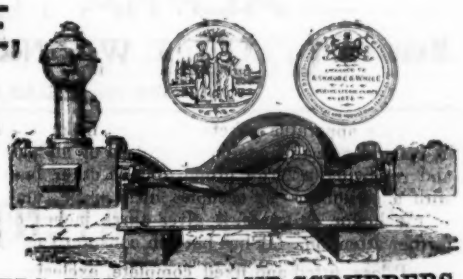

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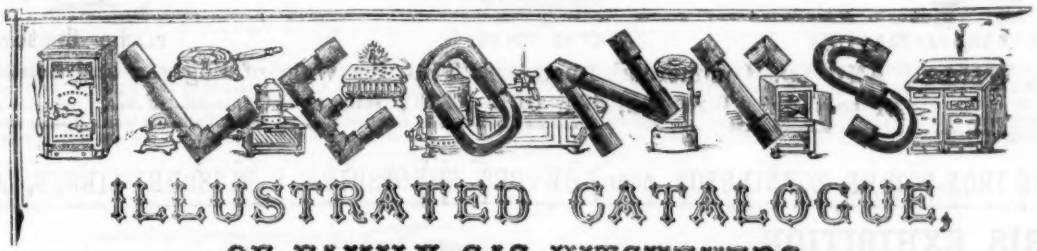
No possibility of Valves sticking, as they are actuated by positive motion from an eccentric.

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**JOHN WM. O'NEILL, Managing Director.**

## LIVESEY'S PATENT WASHER.

This apparatus effects the most intimate contact between the liquor with which it is supplied and the gas passing through it, resulting in the complete removal of all particles of tar, increasing the ammonia strength of the scrubber and condenser liquor, and removing a large proportion of other impurities—notably, carbonic acid. The Washer is intended to work in conjunction with a scrubber. It occupies little space, and is inexpensive. It does not become clogged with tar or corroded by the action of the liquor or gases, it gives three inches of pressure, and only needs a supply of liquor to keep it in regular action without any further attention. It has been in constant successful use for five years, and is now in operation in upwards of fifty places.

Prices, fitted and fixed complete, exclusive of Valves and Connections; all foundations and unskilled labour required in erection to be provided by the Gas Company:—

| Quantities to pass in cubic feet per 24 hours | 100,000 | 250,000 | 500,000 | 750,000 | 1 million | 1½ million | 2 million | 3 million | 4 million |
|---|---|---|---|---|---|---|---|---|---|
| Price each | £30 | £50 | £70 | £95 | £120 | £165 | £200 | £280 | £360 |

*For further Particulars apply to*

**Messrs. DEMPSTER AND SONS, ELLAND, HALIFAX, for the North;**
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TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

## WEST'S GAS IMPROVEMENT COMPANY.
**LIMITED,**

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

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**And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.**

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

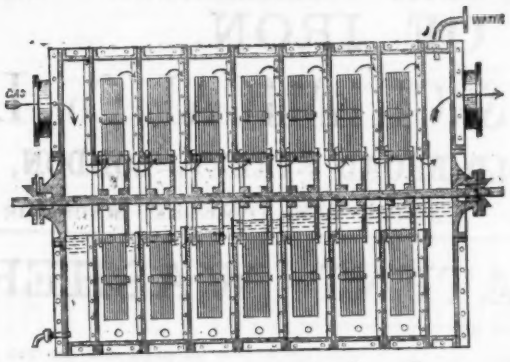
The advantages attending its use are—

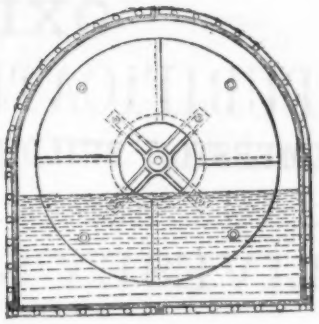
**INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.**

**A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.**

# KIRKHAM, HULETT, & CHANDLER, LIMITED.

## PATENT "STANDARD" WASHER-SCRUBBER COMPANY.



## These Machines contain from 3200 feet to 65,000 feet of Wetted Surface.

The Special Merits of this Washer are as follows:—That it is not necessary to reduce the temperature of the gas to 60°, or thereabouts, to make it effective; and that as no tar is retained in it, the illuminating power is not reduced as in Tower Scrubbers. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas as it ascends. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine, as well as a very large quantity of carbonic acid and sulphuretted hydrogen. That it requires very little outlay for foundations.

**The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—**

Messrs. KIRKHAM and HERSEY. *The Gaslight and Coke Company, Beckton, North Woolwich, June 8, 1880.*

Gentlemen,—I enclose you some particulars of the working of your Washers here, and I intend having some more experiments made, as just now we are working the first Washer with liquor and the second with water. Of course the fact of our having ordered two more, in addition to the four which we have in use, is a sufficient indication of my opinion of the value of the Washer.

(Signed) G. C. TREWBY.

Messrs. KIRKHAM AND HERSEY. *South Metropolitan (late Phœnix) Gaslight Company, Engineer's Office, June 19, 1880.*

Dear Sirs,—The "Standard" Washer which you supplied for use at our Vauxhall station has afforded me entire satisfaction. It was designed to remove the ammonia from 3 million cubic feet of gas per day, and during the past winter it did so with a good working margin to spare. It is as excellent now in workmanship as in design, and is well worthy of the general acceptance with which it appears to be meeting.

I am, respectfully yours, (Signed) CORBET WOODALL.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan. 14, 1879.*

Gentlemen,—In reply to your inquiry, I am pleased to say the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia**, while purifying more Gas than it was intended to do. I enclose particulars of a week's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c., (Signed) JOHN CLARK, Engineer.

*The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—*

| 1879. | Nos. of the Divisions and Strength of Liquor in each. | | | | | | | | | | Water used per Ton of Coals. | Gas Purified per Hour, Cubic Feet. | Ammonia on Outlet. | Temperature. | | | Pressures. | | Revolutions per Minute. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | Inlet. | Outlet. | Atmosphere. | Inlet, Inches. | Outlet, Inches. | |
| | oz. | oz. | oz. | oz. | oz. | oz. | oz. | oz. | oz. | oz. | | | | | | | | | |
| January 7 | 11 | 9 | 7 | 5½ | 3½ | 3 | 1¾ | 1½ | ½ | 0 | 10 Gallons. | 59,000 | Nil. | 74° | 66° | 31° | 25 | 23½ | 5 |
| ,, 8 | 9½ | 7½ | 6 | 4½ | 3 | 2 | 1 | ½ | ½ | 0 | 10 ,, | 78,000 | Nil. | 73° | 61° | 31° | 28 | 26½ | 4½ |
| ,, 9 | 11 | 9 | 7 | 5 | 3½ | 2½ | 1½ | 1 | ½ | 0 | 10 ,, | 82,000 | Nil. | 74° | 67° | 33° | 27½ | 25½ | 5 |
| ,, 10 | 10½ | 8½ | 6½ | 5 | 3½ | 2½ | 1½ | 1 | ½ | 0 | 10 ,, | 66,000 | Nil. | 76° | 64° | 28° | 28½ | 27 | 5 |
| ,, 11 | 12½ | 10 | 7½ | 5½ | 4½ | 3½ | 1½ | 1½ | ½ | 0 | 10 ,, | 61,000 | Nil. | 73° | 64° | 27° | 26½ | 25½ | 5 |
| ,, 12 | 11 | 8½ | 6½ | — | — | — | 1½ | ½ | ½ | 0 | 10 ,, | 39,000 | Nil. | 74° | 64° | 27° | 26½ | 25½ | 5 |
| ,, 13 | 13 | 10½ | 8½ | 6 | 4½ | 3½ | 2 | 1½ | ½ | 0 | 10 ,, | 78,000 | Nil. | 73° | 65° | 42° | 28 | 26 | 5 |

Messrs. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May 23, 1879.*

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

*Working Results obtained from* KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March 6, 1879.*

| Gas passing per Hour, Cubic Feet. | — | Impurities in Gas per 100 Cubic Feet. | | | Temperature. | | Pressure in Inches. | Revolution of Apparatus per Minute. | — | No. of Divisions and Strength of Liquor. | | | | | | | | | | Water Used during Experiment. Gallons. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $SH_2$ | $CO_2$. | Grains. $NH_3$. | Washer. | Air. | | | | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| 64,000 | Inlet | 2·00 | 2·00 | 158·8 | 72 | 57 | 21 | 4½ | Twaddel deg. at 60° | 5·3 | 4·9 | 2·85 | 2·35 | 1·7 | 1·05 | 0·6 | 0·3 | 0·15 | 0·1 | 63 |
| | Outlet | 1·50 | 1·50 | 0·8 | 68 | 57 | 20 | | Acid, ounces. | 11·0 | 8·4 | 6·3 | 4·5 | 2·7 | 1·7 | 1·3 | 0·7 | 0·3 | — | |

Messrs. KIRKHAM and HERSEY. *The Leeds Corporation Gas-Works, Meadow Lane, Aug. 14, 1879.*

Gentlemen,—In reply to your inquiry of yesterday's date, I have pleasure in stating that the item appearing as income derivable from Ammonia in my estimate of revenue for current year is not an exaggeration. Our average income from Ammonia is 2s. 8d. per ton of coals carbonized, but at the works where your invention is in use we derive not less than 3s. per ton. Since the introduction of efficient Scrubbers at our works the greater yield of this product (now twice as valuable as coke to us) is such that the cost of Apparatus for its extraction can be wholly paid for out of from nine to twelve months gains. I am, Gentlemen, yours faithfully, (Signed) H. WOODALL, Engineer.

Messrs. KIRKHAM and HERSEY. *Heywood Local Board Gas-Works, Hooley Bridge, Heywood, Dec. 1, 1879.*

Gentlemen,—In reply to your favour of the 28th ult., I beg to state that the Scrubber is at work, and doing well. I shall be glad to show it to any inquirers.—Yours truly, (Signed) EDWIN BUCKLEY, Engineer.

**For further particulars and testimonials, address Messrs.**

**KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.**

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Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

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Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1¼ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

---

GEORGE'S
## Patent Gas Calorigen,
A STOVE FOR
WARMING AND VENTILATING.
RECOMMENDED BY DR. RICHARDSON.

MANUFACTURERS:
J. F. FARWIG & CO.,
36, QUEEN STREET, CANNON ST., LONDON.

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**Gold Medal Awarded, Paris Exhibition, 1878.**

# THOMAS TURTON AND SONS,
SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
## FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

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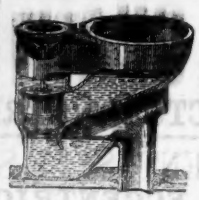

SMEATON'S TRAPLESS CLOSETS.
## MESSRS. W. SMEATON & SONS,
HOT WATER AND SANITARY ENGINEERS.
PATENTEES AND INVENTORS OF THE
TRAPLESS, THE D TRAP, AND EDDYSTONE CLOSETS.
Also the New
ECLIPSE COMBINATION CAST LEAD TRAP,
The Price will be half of the old-fashioned D Trap, it being cast all in lead, without a Joint.
Send at once for an Illustrated Price List to their Wholesale and Retail Agent,
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WALBROOK HOUSE, 37, WALBROOK, LONDON, E.C.
A large Discount to the Trade and Shippers. Estimates Given and Contracts Taken.

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# R. DEMPSTER AND SON'S
## WOOD SIEVES FOR PURIFIERS,

WITH TAPER OR PARALLEL BARS,
MADE BY SPECIAL MACHINERY.
SCRUBBERS FILLED WITH BOARDS,
On our approved principle, for the extraction of Ammonia.
*Prices on application. References to First-Class Engineers.*
ROSE MOUNT IRON-WORKS,
ELLAND, NEAR HALIFAX.
LONDON OFFICES: 2, SUFFOLK LANE, CANNON STREET, E.C.

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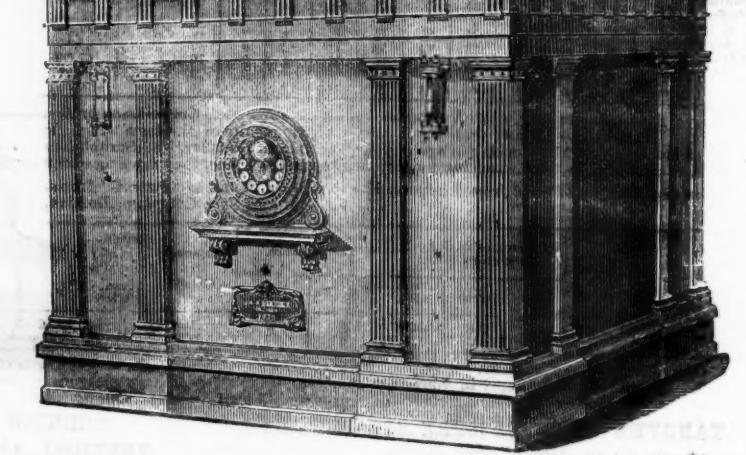
# J. & J. BRADDOCK,
## GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET & DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
BRADDOCK'S PATENT COMPENSATING GAS-GOVERNORS;
ALSO LICENSEES AND MANUFACTURERS OF
WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;
ROUND STATION-METERS,
ON CAST-IRON STANDS.



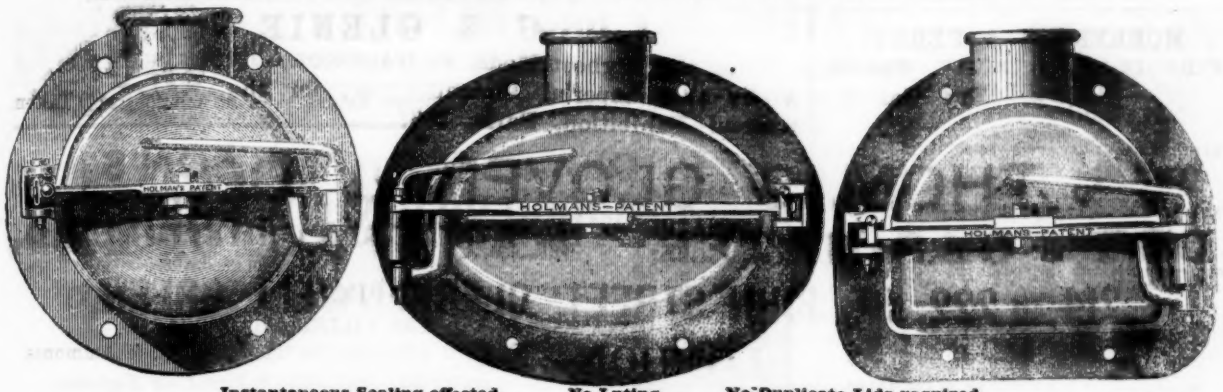
SQUARE STATION-METERS,
WITH PLANED JOINTS.
GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.
GAS COOKING APPARATUS.
Home and Foreign Orders promptly attended to.
All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.
*Orders almost invariably despatched on the day of receipt.*
TERMS, &c., ON APPLICATION.

# TANGYE BROTHERS AND HOLMAN,

## CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

## SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS.

**WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,**
**Anti-Friction Catches, and Self-Sustaining Cross-Bars.**




**Instantaneous Sealing effected. No Luting. No Duplicate Lids required.**
**Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.**

**Morton's Patent Retort-Lids are in use in nearly all the Principal Gas-Works in the United Kingdom and the Colonies; also on the Continent and in the United States of America. They are now made of the**

**SAME FORM OR SECTION AS THE RETORT. (See Illustrations above.)**

**Engineers preparing Specifications of New Works will be furnished with Dimensions of Stock Patterns, together with Approximate Weight and other data on application.**

### HUNT'S
### EQUILIBRIUM DIRECT-MAIN GAS GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

**These Governors have been adopted by many leading Gas Companies, among whom are the following:—**

The Gaslight & Coke Co. (19), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Leicester, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

### TESTIMONIAL.

*The Gaslight and Coke Company,*
*9, Water Street, New Bridge Street,*
*Blackfriars, E.C., Feb. 27, 1875.*

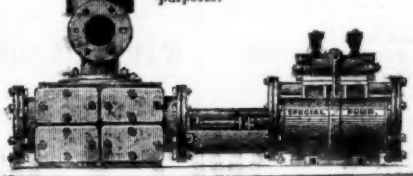
MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

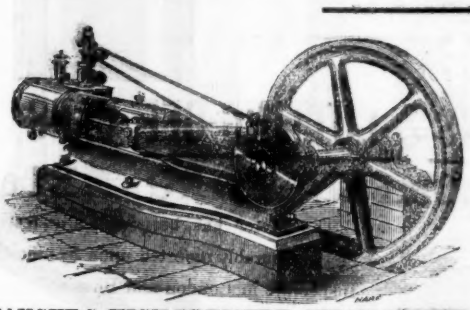
### THE
### "SPECIAL" DIRECT-ACTING STEAM-PUMP.

These Pumps are in use in upwards of one hundred Gas-Works in the United Kingdom, &c., pumping Water, Tar, Ammoniacal Liquor, &c. For Tar, &c., they are provided with extra long distance pieces, and Pumps are entirely of iron, with faced valves to withstand the action of the liquid. The sizes below marked thus * are usually kept in stock for these purposes.



*The quantities delivered of Tar should be taken about two-thirds that of water.*

| Diameter of Steam Cylndr. | Diameter of Water Cylndr. | Length of Stroke. | Gals. of Water per Hour, Approx. | Prices for Water. | Prices for Tar and Ammoniacal Liqr |
|---|---|---|---|---|---|
| *3 in. | 1¼ in. | 9 in. | 450 | £16 0 0 | £17 0 0 |
| *4 ,, | 2 ,, | 9 ,, | 815 | 18 0 0 | 19 0 0 |
| *5 ,, | 2½ ,, | 12 ,, | 1,250 | 21 0 0 | 22 10 0 |
| *5 ,, | 3 ,, | 12 ,, | 1,830 | 22 10 0 | 24 0 0 |
| *6 ,, | 3 ,, | 12 ,, | 1,830 | 25 0 0 | 26 10 0 |
| *6 ,, | 4 ,, | 12 ,, | 3,250 | 30 0 0 | 31 10 0 |
| *6 ,, | 5 ,, | 12 ,, | 5,070 | 35 0 0 | 36 10 0 |
| *7 ,, | 5 ,, | 12 ,, | 5,070 | 40 0 0 | 41 10 0 |
| 7 ,, | 6 ,, | 12 ,, | 7,330 | 45 0 0 | 46 10 0 |
| *8 ,, | 6 ,, | 12 ,, | 7,330 | 50 0 0 | 52 0 0 |
| 10 ,, | 6 ,, | 12 ,, | 7,330 | 60 0 0 | 62 10 0 |
| 10 ,, | 8 ,, | 12 ,, | 13,000 | 75 0 0 | 77 10 0 |



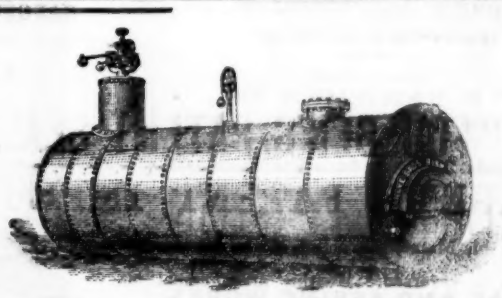
### TANGYE'S HIGH-PRESSURE STEAM-ENGINE,

NEARLY 4000 IN USE.

The Design, Workmanship, and low prices of these Engines have called forth universal approval.

| Nom. H/P. | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 20 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|
| | £28 | £37 | £44 | £68 | £86 | £111 | £122 | £133 | £185 | £215 |

Including Governor and Feed Pump. Variable Expansion extra.



### CORNISH, LANCASHIRE, "THE KESTERTON," VERTICAL, AND MULTITUBULAR STEAM-BOILERS OF SUPERIOR QUALITY ALWAYS IN STOCK.

This Department having been greatly extended and furnished with the most approved Boiler-making Machinery and Tools, T. B. & H. are prepared to supply all kinds of Steam-Boilers with great facility at lowest current prices.

**Also Makers of IMPROVED HYDRAULIC HOISTS, TRAVELLERS, CRABS, CRANES, PULLEY BLOCKS, HYDRAULIC AND SCREW LIFTING JACKS, LATHES, PUNCHING AND SHEARING MACHINES, And all other Descriptions of Tools, &c.**

*FULL PARTICULARS, ESTIMATES, CATALOGUES, &c., ON APPLICATION.*

London, 1851.

New York, 1853.

Paris, 1855.

London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

Paris 1867.

## PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

# THOMAS GLOVER & CO.,

## DRY GAS-METER MANUFACTURERS,

## 214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

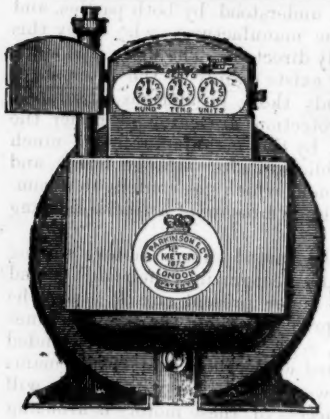
## LONDON, E.C.

### THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

# WILLIAM PARKINSON AND CO.

(ESTABLISHED 1816)



## WET & DRY METERS,

STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

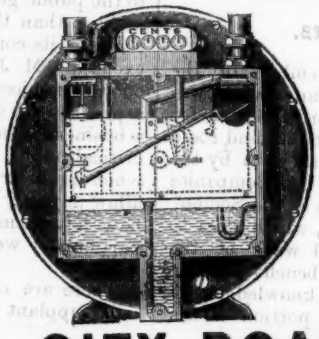
PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

SOLE AGENTS FOR

## FOULGER'S PATENT SEAL UNIONS & CUTTING-OFF CAPS.

## HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low lines much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

## COTTAGE LANE, CITY ROAD, LONDON, E.C.

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## TO SUBSCRIBERS.

BANK HOLIDAY.—*In consequence of the Bank Holiday next week, the* JOURNAL *will not be published till Wednesday, Aug.* 4.

Subscribers who desire to avail themselves of the reduction in the subscription to the JOURNAL by paying in advance for the second half of the year 1880, are reminded that this can only be done during the present month.

Subscribers who have not paid their subscriptions for this, or for any previous year, are requested to remit the same forthwith to the Publisher, in order to prevent any interruption in the regular delivery of the JOURNAL.

## TO CORRESPONDENTS.

*We are compelled to hold over again this week several interesting items of news which have been sent us by correspondents and others.*

D. C. NIVEN.—*Your letter must stand over till next week.*

ONE ANXIOUS.—*Too late for notice or insertion this week.*

THE RESPONSIBILITY FOR THE SAFETY OF HIRED METERS.—*In reference to the answer in last week's issue to our correspondent "W. B.," Mr. Magnus Ohren, the Secretary of the Crystal Palace District Gas Company, sends a copy of the rules and regulations signed by each consumer of gas in the Company's district, one of which—the following—saves the Company from loss of, or damage to their meters:—"The Company will provide meters at rent, and keep them in repair; the consumer, however, being responsible for the safety of the meter, and liable for any damage it may sustain from fire or other accidents, or from carelessness." The case which "W. B." stated was one, we may say, "without any special agreement, but on the usual understanding that the cost of repairs was included in the hire."*


# THE JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

*TUESDAY, JULY* 27, 1880.


## Circular to Gas Companies.

M. JORDAN'S Inaugural Address to the members of the Société Technique de l'Industrie du Gaz en France, which was briefly noticed in our last week's issue, affords matter for more extended comment than we were then able to find room for. Noticeable among the business topics dealt with by the President was the list of donations by various Gas Companies and gas-works proprietors, in aid of the funds of the Société, amounting in all to 9925 frs. (nearly £400), which goes to show the appreciation in which the useful work of the Société is held by those who primarily benefit by the advancement of its members in technical knowledge. It should be stated also that no inconsiderable portion of the funds of the Société is absorbed by the premiums offered yearly for written contributions; the first premium, of 1000 frs. (£40) having this year been awarded to MM. Monnier and Thibaudet, for a paper on the construction of a telescopic gasholder, which we hope to present to our readers on an early date; and the minor prizes were awarded to MM. Brémond, Coze, and Ellissen for papers on the effect of atmospheric rarefaction on the illuminating power of gas, and on "intensive" burners. The Société also offers prizes of 200 frs. (£8) to workmen employed in gas-works, for long service and good conduct, three veterans being rewarded in this way at the last congress.

The President was able to announce with considerable satisfaction that the French railway authorities had for the first time issued tickets at reduced fares to members of the Société attending the congress—a graceful concession, which it would be too much to expect our English Railway Companies to imitate.

M. Jordan, in the course of his general remarks, reflected strongly on the presumption of those enthusiastic amateurs who have made themselves so prominent of late, on both sides of the Channel, by the virulence with which they have attacked the present system of gas illumination; and, without taking the trouble to master the rudiments of the art, have sneered persistently at gas engineers and managers, as ignorant bunglers needing to be swept aside—or, to use their favourite expression, superseded, by electricity or something else, of course under the direction of the said reformers or their friends. M. Jordan stated a well-known source of some of this revolutionary ardour in his reference to the common practice of disappointed inventors, who, failing to secure attention to their often crude proposals, instantly revile the obstinate gas manager, whom they have attempted to enlist into their enterprise, and from that time lose no opportunity of uttering damaging statements respecting gas and all its belongings, to any one who will listen to them. M. Jordan is in perfect unison with Mr. Hunt, in that portion of the address lately delivered before the members of the British Association of Gas Managers, in which the necessity of the co-operation of gas producer with gas consumer was weightily set forth. Much of the observed readiness of the public to listen to any blatant denunciation of Gas Companies is referable to the antagonism which an ill-considered system of regulations, restrictions, and petty evidences of distrust has in too many instances aroused in the relations between the seller and the purchaser of this particular commodity. It is time that the nature of the monopoly enjoyed by the manufacturers of gas in the localities where their operations are carried on should be clearly understood by both parties, and to this end the efforts of the manufacturers who enjoy this protection should be carefully directed. The more it is made manifest that the monopoly exists mainly in the interests of the consumers, and that only those regulations absolutely necessary for their own protection are enforced under the exceptional powers enjoyed by the manufacturers, so much the less readily will the public run after strange lights, and appreciate more fully the benefit which gas confers on a community, and which no other known means of artificial lighting can be shown to possess.

M. Jordan referred to the spread of gas-motors during the last few years, and while recognizing their utility and economy in working, even under present circumstances, he drew attention to the high prices at which the best machines of this kind are now sold, regretting that their extended adoption is not to be expected while their first cost remains so prohibitive. This is, however, a matter which time will cure. The unparalleled success of these motors is arousing wide competition among machinists, and the result cannot but be advantageous to the public.

On the whole, M. Jordan may be said to have concerned himself principally with the aspect presented by gas undertakings to the public generally; and, therefore, his address is of wider interest than the majority of such utterances. Such being the case, its comparative dearth of technical matter may be excused. M. Jordan did not pretend to instruct his hearers on the subject of their daily experiences, but he rather aspired to act as their good-natured friend, telling them, as a business man, what their status really is in the eye of a critical public, and at the same time acting as their advocate when necessary. He did not flatter them, and he would not allow anybody else to abuse them; so, on the whole, he must have left them tolerably well satisfied with themselves, and particularly well pleased with their President.

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There are not wanting indications that the electric light will supplant the great sea-serpent and the gigantic goose-

berry as interesting material for the daily press during the imminent "silly" season. The competitive trial about to take place in Paris, when several of the most celebrated varieties of the luminous arc and incandescent electric lamps will be shown in operation at the Opéra, and the threatened action of the Commissioners of Sewers of the City of London in the same direction, respecting which we have recently expressed an opinion, will offer abundant scope for any number of lurid leaders and graphic letters from special correspondents, and we may be assured that it will not be the fault of those indefatigable purveyors of exciting intelligence to the great British Public if another gas scare fails to arise. The *Standard* is the first in the field this time with a long account of the newest forms in which our old acquaintance, the magneto-electric light, is about to appear before the world on the grand scale to which we have already referred; and as, in the opinion of our contemporary, a crisis in the history of the light will shortly be reached, it will be as well to examine a few of the particulars that are given respecting its present condition and prospects—at least, as they are published by the inventors of the respective systems which are most actively bidding for public support—in order that we may form some sort of judgment, however imperfect, of the progress which has been made in the means of producing, distributing, or regulating the light, since it last enjoyed the perilous honour of forming a stock subject of controversy and speculation.

We need not enter into details respecting the Jablochkoff candle arrangement, which has been described and puffed *ad nauseam*. Suffice it to say that some economy is found practicable in the branch wires which connect the lamps with the main conductor, and an improvement has been made in the arrangements for changing the candles, which has still to be done every two hours, or rather less. In other respects this method of lighting has retained its original peculiarities. A newer aspirant for public favour is the Jamin light, which is developed from vertical sticks of carbon burnt from the lower end, thus reversing the usual order of things. The carbons are much cheaper than the Jablochkoff candles, and do not require attention so frequently. Great things are prophesied of this arrangement, which has been taken up by an influential French company, and we shall hope soon to see whether it will answer as well in England as it is alleged to have done across the Channel. The Brush system, which is one of those good things for which we are indebted to our American "cousins," has been making a great deal of headway in England, and apparently deservedly. For many of the peculiar conditions which the electric light fulfils better than any other luminant, this system will probably grow in favour. The Werdermann light, which in some respects seeks to rival gas in its own domain, has not attracted much attention of late. We are, however, informed that the inventor is about to make a fresh start under highly favourable auspices, when great things are to be achieved, but we must perforce defer judgment until we have had an opportunity of seeing some performance by which to gauge the value of these promises.

Now we have run through the list—not an extensive one by the way—of the principal methods of electric lighting which we shall probably hear most about in the course of the ensuing autumn, and our reflections thereon decidedly tend to strengthen the idea that gas property is not in any great danger from any one of them. It will be noticed that the various electric lamps, and the apparatus used in connection therewith, differ from each other merely in points of detail, and scarcely more than do the different kinds of gas-burners. But in all, the central characteristics remain the same, just as in the parallel example of gas, which possesses a certain distinctive nature whatever means are adopted for consuming it. Now, in the use of electricity as a means of producing light, certain peculiar effects have always been observed to accompany, and, in a certain sense, to qualify the light itself. These effects—such as a constant flickering, and a more or less definite pulsation, by which the illuminating power obtained is caused to vary through a considerable range, both of which, with the liability to even greater disturbance, are in a large measure referable to the direct dependence of the light on the power employed to generate the magneto-electric current, or, in other words, to the absence of any power of compensation from one moment to another—are quite outside the range of any improvements which have as yet been introduced by any of those inventors whose names we have mentioned, or indeed by any other electrician. In view of the interest, and possibly excitement, which the re-appearance of the electric light in our thoroughfares is well calculated to arouse, it cannot be too widely known that there has been no striking change whatsoever in the character of the light itself, that all its well-known imperfections remain as evident as before, and, consequently, that it would be worse than folly on the part of the owners of gas property to fall into any of the traps which will in all probability be laid for them if the favourable opportunity arises, and the public display any tendency to undergo another fit of electrical mania.

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The Sutton, Southcoates, and Drypool Gas Company, which is one of three Gas Companies supplying the town of Hull, have been endeavouring, in the House of Lords, to prevent the Corporation acquiring the power to light the streets and public buildings of the town by electricity, but without success. The system of lighting which the Corporation desire to adopt is that of Dr. Siemens, which is calculated principally for highly concentrated lights, such as would be used for harbours, docks, &c. This one of the three Companies probably felt themselves particularly aggrieved by the proposal to use electricity for such purposes, from the circumstances of their own district, but it could not be contended on their behalf that Gas Companies have any monopoly of public lighting other than that constructively dependent on their power to break up the streets for laying pipes; and as, moreover, the Company did not come before the Committee with a very clean record, the prayer of their petition was disregarded, and the Corporation obtained the power they sought, which, among other things, includes the appropriation of £50,000 for the purpose of carrying out the necessary arrangements. This is a tolerably large capital to devote to what is really an experiment, although it was not expressly described as such; and we should like to know in this case, as in others, what is to compensate the ratepayers for their liability under the new Act. When large sums, as in some instances which might be named, are taken from gas consumers in aid of the rates, a common argument in justification is, that as the ratepayers are liable for the capital invested in the gas undertaking, they ought to be also considered in the appropriation of the profits. But in the present case, wherein the ratepayers risk is very appreciable, there is an express provision forbidding the Corporation making any profits at all. Truly, if in an advanced state of civilization legislation is to proceed on rational and uniform principles, the conflicting statutes of the present generation will afford our more favoured descendants amusement rather than instruction.

There was recently a severe parliamentary conflict over the Maidstone Gas Bill, in the course of which a great deal of evidence was offered on the part of the Corporation which was, to say the least, of a somewhat startling character, and such as, if it could be maintained, should have a material influence on future gas legislation. A new chapter in the history of gas purification from sulphur was opened by Mr. Hawksley, to whom we feel we should do an injustice by attempting to make extracts from his evidence, and we must therefore refer our readers for further information to the full report which appears in another column. Unfortunately the Committee on the Bill were not permitted the advantage of hearing Mr. Vernon Harcourt's opinion respecting Mr. Hawksley's method of doing, without trouble, nuisance, or expense, something which no other gas engineer in London or the provinces has as yet succeeded in doing with such approach to perfection; but, under the circumstances, it was probably considered that criticism or corroboration were alike superfluous.

Some time since the advisability of the purchase by the Local Board, of the undertaking of the Northwich Gas Company was seriously debated by the former body, and the result was that a Committee was appointed to treat with the Company as to terms and conditions. But after one interview had taken place between the parties, the Committee became frightened about the electric light, and concluded to stand aside and await the course of events. Gas having kept its ground, and the Company having written twice to inquire what the Committee were doing, the subject was mentioned again at the last meeting of the Board, when a resolution ordering the negotiations to be commenced anew, was carried after much desultory discussion. The usual accusations of arbitrary action and indifference to the wishes of the public were made against the Company, which perhaps may be taken to mean that a little more courtesy might be expected from some of the officials, but this can hardly be considered sufficient reason for proceeding in a hostile spirit against the Company. It appears that the Chairman of the Committee himself had a grievance against the Company when he last waited on them, and in his case the mixture of private interests with public duty resulted disastrously to the former. Let us hope that nothing of this kind will occur again to influence the

attainment of a fair understanding between the contending parties when next they meet.

The Chester City Treasurer, Mr. J. E. Edwards, has just presented his report to the Town Council on the state of the Chester United Gas Company's accounts, which he was directed to audit. The returns show well for the Company, who have paid maximum dividends since 1875, and made contributions to the reserve-fund equal to one and a quarter per cent. on the stock and share capital. Up to the close of the year 1878 the total capital expenditure on the undertaking had been £89,474 11s. 2d., which, although certainly ample, can scarcely be called excessive, as hinted by the Treasurer, and the price of gas has been reduced ninepence per thousand feet since 1875. The Treasurer, however, advices that in the Company's new Act certain provisions should be inserted for the benefit of the town, such as a renewal of the power of the Corporation to purchase the works, a reduction in the maximum price of gas and the cost of the public lamps, and an increased illuminating power. No definite suggestions are made as to these several concessions, which will, if the report be adopted, form fit subjects for arrangement between the Council and the Company. There is no allegation of any lack of purity of the gas, or other default on the part of the Company, although such matters might not have come fairly within the scope of the Treasurer's inquiry. The report, on the whole, testifies to the consideration which the Company have shown to their customers, and this should be remembered when further restrictions are sought to be imposed upon them.

It is edifying to observe how the representative bodies of neighbouring districts love one another—especially if there should also happen to be any business relations between them. When a local authority has become possessed of a gas undertaking, for instance, which extends its business into another district, the differential rates which frequently exist in favour of the proprietary district form a very fruitful source of dissatisfaction, sometimes leading to open rupture. The Salford Gas Committee a short time since proposed to reduce the price of gas in the borough threepence per thousand feet, but in the outer region, including the parts watched over by the Barton and Swinton Local Boards, the reduction was to be one penny only. This arrangement, of course, struck the members of the latter bodies as being very unjust, while the Chairman of the Barton Local Board is reported to have said at a recent meeting that "in Salford "they"—presumably the Gas Committee—"have no principle "except to get as much as they can." We fear the allegation would apply to many other places and people besides the unfortunate victims of the Chairman's displeasure, and a cynic might even credit the same feeling with having originated the very expression which so emphatically condemned it.

The Winchester Town Council, apparently tired already of their experiment of lighting the streets with petroleum in place of the gas formerly used there, are turning their attention to the possibilities of electricity for use in that connection. A deputation from the Council recently came to London and made a thorough inspection of the Brush system, which it is thought they can use by appropriating for the purpose the steam-engine, plant, and buildings at the sewage pumping station. As anything that may result from the visit will not damage the Gas Company, who have for some time past lost the lighting of the public lamps, we may wish the Town Council joy of their enterprise.

## Water and Sanitary Notes.

The progress made with the London Water Supply inquiry has been somewhat slower than the pace we reckoned upon last week. The Select Committee met on Tuesday, and after deliberating with closed doors, for two hours, on the terms of their report, adjourned their proceedings for a week. In the meantime, a melancholy event has transpired in connection with the inquiry. Mr. Edmund James Smith, who was the principal witness before the Select Committee, died on Wednesday last, somewhat suddenly. Although the deceased gentleman was over sixty years of age, the event is a startling one, and much to be regretted. Sir Edmund Beckett may be congratulated on having vindicated Mr. Smith before the Committee, prior to this sad occurrence. The testimony given by Sir Edmund was generous and emphatic, and might be looked upon as compensating for the misapprehension and prejudice to which Mr. Smith had been subjected in respect to the negotiations for the purchase of the undertakings appertaining to the London Water Companies. "Everybody "who has heard Mr. Smith's evidence," said Sir E. Beckett, "and everybody who has parliamentary experience such as "mine, will concur in this, at any rate—that no such ex-"hibition of masterly calculation has ever been witnessed in "these rooms, I can say, for thirty-six years. I have heard "the late Mr. Bidder, who was a famous calculator; but "there is more than calculation in this, and I have never "heard such a masterly power of calculation, together with "the policy and reason involved in the calculation, as Mr. "Smith's." It may not be amiss to add a few words which followed. "Further, I have this to say," said Sir E. Beckett. "I doubt if even now a hundred people in London, outside of "those who are obliged to attend to it and understand it, "really understand this bargain." Sir Edmund acknowledged that until he was obliged to master the question, he did not himself understand the transaction. "I had read outcries in "the newspapers about it," said the learned Counsel; "I had "read outrageous figures showing I know not how many "years purchase which the Companies were going to get, and "I have read a lot of other enormities; and although I am "not given to believe all that one reads in the newspapers, "or to assume that newspaper editors know everything, still "I confess that I have been 'taken in' for a while." It is to be feared, as Sir Edmund intimates, that there is still a general misconception as to the merits of the question. The figures are affected by the facts, and the facts are not realized, except by a very few. Mr. Smith was able to see both sides of the question, and time will probably show that he was far more correct in his judgment than those who criticized and denounced his conclusions. It is well that he lived to give his evidence, but his death at the present juncture is nevertheless a public loss.

Commenting on a passage of arms which took place in the London Water Supply Committee, between the Chairman and Sir E. Beckett, the *Evening Standard* last week compared Sir William Harcourt to "the fretful porcupine." The learned Counsel was defending the late Mr. E. J. Smith against the depreciatory remarks made by Mr. Michael, when "the genial and always agreeable Home Secretary" interposed by saying "he hardly thought that Sir Edmund "Beckett could have taken the trouble to read the evidence." Our contemporary observes that it was Sir Edmund's duty to be familiar with the evidence, and there could be no doubt that he had taken proper pains to master the details. "Sir William Harcourt's sneer," it is remarked, "was none "the less offensive on that account;" and Sir Edmund Beckett is commended for his moderation in simply replying, "Indeed I have." The *Evening Standard*, referring to the incident, proceeds to say that, in response to this avowal, "Sir William Harcourt—the fretful porcupine—severely "replied, 'Go on, and I expect you will treat us with "'respect.'" It is suggested that, "if Sir William Harcourt "desires to be 'treated with respect,' it would not be by any "means a bad idea if he began by showing some sort of "respect for other people." We are glad to find our contemporary saying that Sir Edmund Beckett, in defending Mr. Smith, spoke "very much to the point." Unfortunately, it is not often that the daily press will allow anything to be good which appears on the side of the Water Companies.

The singular manner in which Sir W. Harcourt has regulated the proceedings of the Select Committee on the London Water Supply, as we noticed last week, has led to considerable perplexity among the civic authorities. At the meeting of the Commissioners of Sewers of the City of London last Tuesday, an animated debate took place as to whether or not the opportunity was past for bringing forward evidence concerning the rate of charge for the water supplied to warehouses and offices. Mr. Bedford, quoting from Sir W. Harcourt's remarks and from the speech of Sir E. Beckett, declared that the case of the City had been "thrown over "utterly and entirely." "We went before the Committee of "the House of Commons," said Mr. Bedford, "to protect "the interests of the citizens, which have not been con-"sidered for one single minute. What we could have been "about in employing Counsel to state the case of the City, "and not one single allusion to be made by them to our great "grievance, I cannot comprehend for the life of me." "We "have been of no more use in the House of Commons Com-"mittee," continued Mr. Bedford, "than if we had gone to "Salisbury Plain." We may suggest that perhaps Sir W. Harcourt was too good a lawyer to think the "great "grievance" of the City to be of much value as a weapon of attack against the Companies. Hence he first requested the learned Counsel to limit themselves to a consideration of the agreements, and afterwards remarked that the City had brought forward no evidence as to the "basis of charge," neither had Mr. Michael referred to it in his address. Sir

William was clever, and as yet the Commissioners of Sewers are at a loss to know whom they are to blame. Some of the Commissioners, we observe, try to think that everything is right, and declare that Mr. Bedford is "dreaming." It is clear, however, that Sir W. Harcourt is sufficiently awake.

An article on the "The London Water Question," by Dr. Humphrey Sandwith, in the current number of the *British Quarterly Review*, asserts that "London continues to be "supplied with diluted sewage water," though it is allowed that this "is perhaps good enough for washing the streets." Such statements will indicate at once to those of our readers who have not seen the dissertation itself, what kind of matter the article contains. Every possible charge that can be brought against the Water Supply of the Metropolis is raked up from the history of the past, no recognition being given to the fact that there is a marked difference between the supply as it existed some years back and at the present time. Yet to ignore the improvements which have been carried out by the London Water Companies in recent years, is to present a view of the subject which is altogether out of date. Dr. Sandwith also fails to show what is to be the remedy for the state of things which he deplores. "Long as our article is," he tells us, "we have by no means exhausted this most important "subject." This is perfectly true, as the Doctor indicates when he goes on to say: "Very much might be written on "the various plans suggested by engineers for supplying the "Metropolis with fine spring water, or with pure rain water "collected from the large surfaces of barren tracts, or from "lakes in Wales or Westmoreland." Much might be said concerning these proposals, we have no doubt, but it is easier to find fault with things as they are than to demonstrate a practical remedy. These magnificent schemes will be found to have their drawbacks, and in the meantime the extension of the constant service is conferring, as it goes on, a substantial boon on the consumer. Dr. Sandwith only glances at this part of the question, and concludes by declaring "the "necessity of an entire change of the source of the supply, "and the urgent need of taking the administration of this "necessity of life out of the hands of trading Companies." If the water supply were not in the hands of "trading "Companies," perhaps there would be less agitation on this "most important subject."

The East Ham Local Board having asked the East London Water-Works Company to do something for which the Company's Act gives no authority, and the Company having, therefore, replied that they could not comply with the Board's request, the Clerk to the Local Board has been instructed to write to the Home Secretary on the matter, asking the Government "to grant additional powers to Local Boards, "and prevent the Company overriding their decisions!"

Opposition to the Liverpool Corporation Water Bill was threatened in the House of Lords by the action of several large ratepayers, including members of the City Council. These parties presented a petition to the Upper House, praying to be heard by counsel against the preamble of the Bill. The petitioners objected to the leading features of the scheme—engineering, sanitary, and financial. They alleged there was no immediate necessity for an additional supply of water for the inhabitants of Liverpool, the present available sources being sufficient for the next fifteen or twenty years; and, further, that an abundant supply of water could be obtained within a district more accessible than the distant region of the River Vyrnwy. Another statement was, that when the ratepayers were polled on this question, the estimate for the scheme was £1,250,000, whereas the Bill empowers the Corporation to borrow £3,250,000. It was also objected that the scheme, if carried out, would be perilous to life and property, owing to the enormous quantity of water that would be stored in an elevated position. When the Bill came before the Lords last Thursday, Sir E. Beckett raised a preliminary objection to the *locus standi* of the petitioners, who, he contended, were only fourteen out of the seventy thousand ratepayers of Liverpool. After hearing the arguments, which lasted about two hours, the Committee decided against allowing the petitioners *locus standi*, and the Bill thus became practically an unopposed measure.

The extension works of the South Staffordshire Water-Works Company at Cannock were formally opened on Wednesday last, when a numerous party came together at the invitation of the Directors of the Company, many of the Local Authorities and gentry being present. After the inspection of the works, a luncheon was served, Mr. F. James, the Chairman of the Company, presiding. The Company have been carrying on their operations for now more than twenty years, the undertaking having been originated by the late Mr. J. R. M'Clean, M.P. The first sod of the Lichfield reservoir was turned by Lord Ward in 1856, and the pumping-engines connected therewith were started in 1858. The works are now so much extended that although the district is one of immense area, the yield is far in excess of the present demand upon the Company's resources, and it rests with the Local Authorities of the contignous towns to avail themselves of the ample supply placed at their disposal. The capital outlay of the Company at present amounts to £720,000 the extension works last completed having absorbed about £300,000. It is to be hoped that the Company will be rewarded for their enterprise, which hitherto has not brought them much in the shape of dividends. If the Local Authorities do their duty, the public and the Company will alike be benefited.

The transfer of the water supply of Stockton and Middlesbrough to the Local Authorities has by no means brightened the prospects of the consumers, financially or otherwise. Water is still taken from the Tees, and while more and better water is demanded, there seems very little chance of these requirements being met. A deficiency is not yet experienced, but the limit of the present supply is so nearly reached that it is deemed impossible to construct new works and introduce a fresh supply in time to meet the wants of the district. It is not likely that Parliament will authorize the pumping of more than 60 million gallons of water from the Tees, and when this limit is reached the situation threatens to be embarrassing. The new works that were to be constructed in order to introduce a pure supply, are said to be too costly to be undertaken at present, and yet they ought to be in progress. The Water Board, it is argued, must perforce seek for an enlarged and improved supply, but where this is to be obtained, and how it is to be paid for, are matters at present undetermined. The example is one which London may contemplate with advantage.

Viscount Midleton, in the House of Lords, recently called attention to the report of the Royal Commissioners on Noxious Vapours, and inquired whether or not there is a prospect of legislation in accordance with the recommendations given in that report. With the revival of trade, said the noble Viscount, noxious vapours were on the increase. Viscount Enfield, in reply, could only promise something "next year," and, of course, nothing more could be expected from him.

## THE LATE MR. F. J. EVANS.

To look back through the professional life of the late Mr. Evans is to bring before the mind's eye the history of gas lighting during more than forty eventful years. In the course of this long period, Mr. Evans was engaged in the active conduct of gas undertakings, and for the greater portion of it held a conspicuous place among those who were developing and improving the processes for the manufacture, purification, and supply of gas.

Born in the year 1818, he was the son of Mr. John Evans, for some time one of the Engineers, and afterwards a Director of the Chartered Gas Company—a career which, in its mere outline, was remarkably duplicated by the subject of our notice. Mr. Evans, who was educated at St. Peter's Grammar School, Eaton Square, S.W., entered the service of the Chartered Gas Company in the year 1834, being then under 16 years of age. In 1836 he accepted an engagement with the Imperial Continental Gas Association, and remained in the employment of that Association for a short time at their gas-works in Berlin. Returning to London, in November, 1839, he re-entered the service of the Chartered Company, and from that time forward, although in varying capacities, his connection remained uninterrupted with it (the Chartered Company) until finally severed by his death. He was appointed Superintendent of the Brick Lane station in 1844, and removed to a like position at Westminster in 1848. During all this time the late Mr. George Lowe occupied the position of Engineer to the Company, Mr. Evans serving under him. In 1863, upon the resignation of Mr. Lowe, the chief place was given to Mr. Evans, and he continued to hold it until 1872, when he, too, retired, full of "honours," if not of "years," having largely contributed to the raising of the Company to that position of security and pre-eminence which it then held and still holds. In our "Circular" of Dec. 29, 1863, we noticed the retirement of Mr. George Lowe, after 42 years service, and proceeded as follows:—"He is succeeded in his office by Mr. F. J. Evans, who has for many years been the Engineer of the Chartered Company's works at Westminster, and it would be difficult to find a more competent successor to Mr. Lowe." The opinion thus expressed was founded upon the work he had already accomplished, and how fully it was justified by his subsequent career our readers well know.

Mr. Evans was possessed of great industry and a power of patient application and experimental research, which, cultivated in early days, remained with him till the last. He first devised and adopted the system, afterwards widely followed, of ventilating purifiers, and the foul material contained in them, so as to avoid nuisance when the charge was being changed. His discovery of the fact that oxide of iron, which had been used for the absorption of sulphuretted

hydrogen, could be "revived" and re-used many times for the same purpose, was the result of his "thorough" method of conducting investigations. Trying a proposed plan for the removal of ammonia, he noticed the changed appearance of the material after it had been exposed to the air, and immediately set himself to ascertain the cause; hence resulted what was practically a revolution in the method of purifying coal gas. The merit of this discovery is in no way lessened by the fact that others had been acquainted with the scientific facts involved. By Mr. Evans it was a matter of original observation, and the practical application was all his own. The designing of the enclosed photometer which bears his name, and which is now so generally employed, is another evidence of his individuality, and of his attention to the details of the work he was engaged in.

Mr. Evans may be said in some sense to have belonged to a generation which has gone. Most of those who were the contemporaries of his earlier years of work have either passed away, or had sooner withdrawn from the active pursuit of the profession to which they and he belonged. It is no small tribute to his continued application and freedom from prejudice that at the time of his retirement he held a more advanced position among the workers in that profession than at any earlier period in his career. He was not a man to travel in a rut, or to disparage the work of younger men; indeed, he seemed rather to be drawn towards the young and enthusiastic, and such have, we know, found in him a congenial and sympathetic guide and companion.

It is doubtless in connection with the bold idea of the Beckton works, and the admirable carrying out of that idea, that Mr. Evans will be most widely known and remembered. It is not for us here to speculate as to the just apportionment of the merit of that really great conception. It is enough for our purpose to know that Mr. Evans was the responsible adviser of the Chartered Gas Company at the time; that when many of his professional brethren shook their heads, and foretold only disaster, he did not hesitate, but always confidently promised success; and that in his hands that success was fully attained. One of the dangers predicted was that the illuminating power of the gas would be so seriously reduced in the long journey to town, that the gravest consequences would ensue. Mr. Evans had already, before commencing the works, conducted a series of experiments, assisted, we believe, by Mr. Sugg, the results of which enabled him to listen to these prophecies with a calm mind and perfect confidence.

The honour due to Mr. Evans on account of the Beckton works by no means stops short at the mere idea. He devoted himself earnestly to the details of the great work, his talent as a draughtsman enabling him to prepare many of the original drawings with his own hand. That some portions of the diversified whole should have been open to, and received adverse criticism, was inevitable, especially when we remember that it was carried out under the "fierce light" of such general observation. The errors, however, which had to be amended were conspicuously those of a man who thought for himself, and had the courage of his theories, and they were but as a drop of failure in the full measure of success. The later developments of the Beckton works have been carried out on the lines originally laid down by Mr. Evans, and the whole forms not only by far the most extensive and imposing gas-works ever planned but also probably the most complete and perfect in its general design and arrangement. To the memory of Mr. Evans, Beckton is an enduring monument, boldly conceived, thoughtfully designed, and successfully executed. Throughout the work he was fortunate in having the help of so loyal and accomplished a "right hand" as Mr. Wyatt, and we feel sure that we are acting as Mr. Evans would have wished in here associating that gentleman's name with his.

In 1868 Mr. Evans was appointed by the Board of Trade one of the first Metropolitan Gas Referees under the City of London Gas Act of that year—a position which he resigned in 1870. In 1872 he closed his long professional connection with The Gaslight and Coke Company, surrendering his position of Chief Engineer in the early part of that year. At the Shareholders meeting in April, the value of Mr. Evans's services was gratefully and cordially acknowledged, and, in recognition of them, he was unanimously and amid the cheers of those present, allowed a retiring pension equal to his former salary, and elected to a seat on the Board of Direction.

In his relations with those about him, especially with his brother officers, Mr. Evans was thoughtful and courteous, always ready to help or encourage those who were trying to do well. He often received the special thanks of the Court of Directors, and four times the officers of the Company expressed their regard for, and indebtedness to him, by presenting him with testimonials, which were by him highly prized. The members of the British Association of Gas Managers will remember how kindly he interested himself on the several occasions when the Association visited Beckton, sparing no effort to make the inspection as pleasant and instructive as possible. The last of these visits was paid within a month of his decease, and he then seemed as heartily interested in the matters he was explaining and discussing, and as concerned to do all he could for his guests, as at any previous time.

Almost the only words spoken by Mr. Evans after his seizure were to ask the question, "What was the cause?"—a question characteristic of the man. Although he had contributed a long life's work to the gas industry, he was only in his sixty-second year when he died. Because of that work he will be long remembered, and in a closer and more affectionate manner his memory will be cherished by the large circle of those who enjoyed his friendship, and so were enabled to appreciate the many virtues of his modest and kindly nature.

## EXAMINATIONS IN "GAS MANUFACTURE."

The list of the successful candidates in the examinations held throughout the country last May, under the auspices of the City and Guilds of London Institute for the Advancement of Technical Education, has just been published. The following table, in reference to the examinations in the "Gas Manufacture" section, is compiled from the pass list:—

| | | Class of Certificate. | Prizes. | Previous Successes. |
|---|---|---|---|---|
| *Honours Grade.* | | | | |
| Blair, Thomas | London | First. | First Prize, a Silver Medal and £5. | 1879. Advanced First, with First Prize of £7.<br>1878. Elementary First, with First Prize of £5. |
| Meiklejohn, Neill | Houghton-le-Spring | First. | Third Prize, a Bronze Medal. | 1879. Elementary First, with First Prize of £5. |
| Hulse, William W. | Burslem | Second. | | |
| Margetts, William Thomas. | Rochester | Second. | | |
| M'Gillivray, Hugh | Edinburgh | Second. | | |
| *Advanced Grade.* | | | | |
| Bell, John Ferguson | Liverpool | First. | First Prize, a Silver Medal and £3. | 1879. Elementary First. |
| High, William Robert | London | First. | Second Prize, a Bronze Medal and £3. | |
| Hornby, John | London | First. | Third Prize, a Bronze Medal. | 1879. Elementary First. |
| Akroyd, Benjamin | Halifax | First. | . . . . . | 1877. Elementary First, with First Prize of £5. |
| Aspel, Samuel Fisher | Leicester | Second. | | |
| Batten, William T. | London | Second. | | |
| Dunsfield, John | Oldham | Second. | | |
| Flambe, Hilary E. | London | Second. | | |
| Meiklejohn, Charles | Houghton-le-Spring | Second. | . . . . . | 1879. Elementary Second. |
| Sheard, John Tomlinson | Batley | Second. | | |
| *Elementary Grade.* | | | | |
| Lewis, Benjamin A. | London | First. | Second Prize, a Bronze Medal and £2. | |
| Dempster, Alexander | Halifax | First. | Third Prize, a Bronze Medal. | |
| Baynes, Francis James | Bolton | Second. | | |
| Jones, Richard Enos | Bristol | Second. | | |
| Lovatt, George Thomas | Wolverton | Second. | | |
| M'Lean, William | Oldham | Second. | | |
| Morris, William Walter | Jarrow-on-Tyne | Second. | | |
| Plant, Joseph. | Wolverton | Second. | . . . . . | 1879. Elementary Second. |
| Wilkinson, Harry | London | Second. | | |

YEOVIL GAS COMPANY.—The annual general meeting of this Company was held yesterday, when the Directors reported that the works were maintained in good order. The profit for the year ended June 30 amounted to £1907, which allowed of a dividend being paid of 10 per cent. This would absorb £1482, leaving £425 to carry forward. During the past year the Company have carbonized 2121 tons of coal and cannel, costing £1378 17s. 2d., and produced 20,844,200 feet of gas, of which 17,423,600 feet were supplied for private lighting, and 1,988,000 to the public lamps.

A WONDERFUL GAS WELL.—"An Occasional Correspondent" of the *Globe*, writing from Sheffield, Warren County, Penn., U.S.A., says: "The most wonderful part of Sheffield is a natural gas well. The gas from this well is used in the furnace of the tannery of Horton, Crary, and Co., and runs the machinery; it also lights all the houses in the town, being brought in iron pipes 2 miles from the well. It was discovered in boring for petroleum. Escape-pipes have been run up to a height of some 20 feet, and the huge flames from these pipes flare away day and night, and have done so for the last five years. The daily amount given off is estimated at 2 million feet. The gas was found at a depth of 1350 feet, and blew all the boring machinery out of the well. The pressure is so great when turned full on that the gas blows itself out. The smell is not the same as coal gas, but more like petroleum. There is little doubt this gas vein is on the edge of a petroleum field, or, more probably, all the land near is underlaid with it. The amount has not been found to lessen, nor the pressure diminish in the whole five years. It seems such waste to see these six or eight escape-pipes flaming away day and night, as they have done for the last five years. How long they will go on no one can tell, but at present it looks as if for ever. At present they have found no way to utilize the gas except on the spot. There is a new petroleum well just successfully sunk at Clifton, 7 miles from Sheffield, and there is little doubt but that others will be found in the neighbourhood."

## Communicated Articles.

### THE IMPROVED GENERATOR FURNACES AT THE MUNICH GAS-WORKS.

By "Isca."

Dr. Schilling, to whom we are indebted for so much of the information at present available respecting the working of gas generator furnaces for retort-settings, has lately contributed to the *Journal für Gasbeleuchtung* a most instructive account of his latest improvements in this line, as embodied in the new gas generators constructed by him at the Munich Gas-Works. Proceeding on the same principles which distinguished his earlier gas furnaces, and which may be described as consisting of the admission of steam to the generator with the object of preventing the formation of coherent clinker therein, and of elaborate provision in the space underneath the retort-setting (where, in a stage retort-house on the English plan, the coke arches would be situated) for heating the air to be used in the second stage of combustion by the waste heat of the furnace gases, Dr. Schilling's improvements have been mainly directed towards perfecting the arrangements for heating the air in the regeneration, as he terms this process, and to providing a better means of producing the steam to be used in the generator. Respecting the former object, all designers of generator furnaces have recognized its importance; but the latter arrangement, the introduction of which was Dr. Schilling's own device for meeting a universally acknowledged defect, is a necessity of his own creating, and its economical advantages are much questioned by Liegel and others, who claim to have surmounted the difficulty without the introduction of more steam than can be supplied by an ordinary wet ash-pan. The cost of producing the required steam was a point of which Dr. Schilling's critics did not fail to make the most, and he appears to have himself felt that the idea was imperfect so long as special means of providing the steam continued necessary, and he now announces that by his last improvements the production of steam in the required volume is effected entirely without cost, by utilizing a portion of the waste heat of the furnace for this purpose.

On referring to the accompanying engravings, the arrangements for regeneration will be clearly understood.

The air passages are represented by the numbers 1 to 6, the smoke flues by the Greek letters $\alpha$ to $\zeta$. The cold air enters at 1 into the canal 1′ through the front wall, and travels back to the entrance of 2, then forwards to get into 3, then back along this to 4, then again forward, passing upwards to 5, along which it goes back to 6, and out of this it finally issues to meet the combustible gases from the generator at the "slit" or burner. The furnace or smoke gases, which pass out of the setting by openings underneath the bottom retorts, take a forward course from $\alpha$ to $\beta$, and then backwards in $\gamma$, and forwards in $\delta$. From this point they pass through the flues $\delta'$ and $\epsilon$ underneath the boiler, and in $\zeta$ they pass backwards to the main flue. Formerly the damper for the exit flues was between the retort-setting and the regenerator; but it has been altered to a point below, so as to control the draught in the regenerating passages also.

As regards the apparatus for producing steam, a sort of boiler is fixed in the bottom of the generator, and the smoke gases from the regenerator are led backwards and forwards under it before being allowed to pass away. Originally these gases, the volume of which became increased in the proportion of 100 to 170 by admixture of air, still possessed the temperature of 1470° Fahr. when permitted to escape. With the alteration in the regenerator from the old pattern, the volume of the smoke gases ceased to increase, and their temperature at departure never reached this figure. When Bohemian coal was being used in 3-hour charges, the boiler which was first used, with a heating surface of 1·46 square mètres, was quite capable of producing the necessary quantity of steam—about 570 kilos. in 24 hours (0·5 kilo. of $H_2O$ per kilo. of coal). When using Saarbrück coal in 4-hour charges, the quantity of steam required for which was 0·7 kilo. per kilo. of coal, it was found necessary to increase the heating surface of the boiler by lengthening it, and providing an additional tube for the smoke gases, so that the heating surface was made 2·8 square mètres. In order to cause the air to enter the middle of the generator as completely as possible, and to prevent it from creeping along the walls, an inclined plate has been introduced which causes the air to pass over the surface of the water to the fire-bars. The air supply is also regulated by a valve $4\frac{3}{4}$ inches square, but generally kept open about 1 inch only, in a plate in front of the inclined shield, so that the entire air supply, neglecting leakages, is maintained through an opening $4\frac{3}{4}$ inches long by 1 inch wide. The whole arrangements, as actually working, are shown in the illustrations.

Respecting the working results, Dr. Schilling states that the improved generators have been working 21 months; during the last year carbonizing chiefly Saarbrück coal, with a mixture of 10 per cent. of Bohemian Platten coal. There was a stoppage towards the close of last summer, owing to the ascension-pipes getting choked, and thick tar forming in the hydraulic main. When the tar became cold, it was so thick that it would not flow, and it was very difficult to get rid of it. At the same time naphthaline was formed in large quantities, not so much in the works as in the town mains, frequently at considerable distances from the works. The heats in the retorts had been very high about this time, and with 3-hour charges upwards of 10,600 cubic feet of gas were produced per retort in 24 hours. The heats having been moderated, these inconveniences at once disappeared, and the system of working was altered, each retort being made to produce about 9000 cubic feet of gas per 24 hours, the heats being maintained sufficiently high for this purpose. Under these circumstances the adoption of 4-hour instead of 3-hour charges appeared advantageous in an economic sense, and in this way the work was carried on without the slightest interruption throughout the whole of last winter. As a number of old fire-grate settings were in use besides the generator settings, the results of the latter were kept separate by special weighing and measuring. The following statement shows the working from the 7th to the 18th of January last, with Saarbrück coal alone:—

| | |
|---|---|
| Production of gas per retort per 24 hours | 9,100 cubic feet. |
| ,, ,, setting (8) per 24 hours | 72,800 ,, |
| Weight of coal carbonized per retort ,, | 1,894 lbs. |
| ,, ,, ,, setting ,, | 15,152 ,, |
| Production of gas per ton of coal (nearly) | 10,800 cubic feet. |
| Consumption of coke per setting in 24 hours | 2,086 lbs. |
| ,, ,, 100 lbs. coal carbonized | 14 ,, |

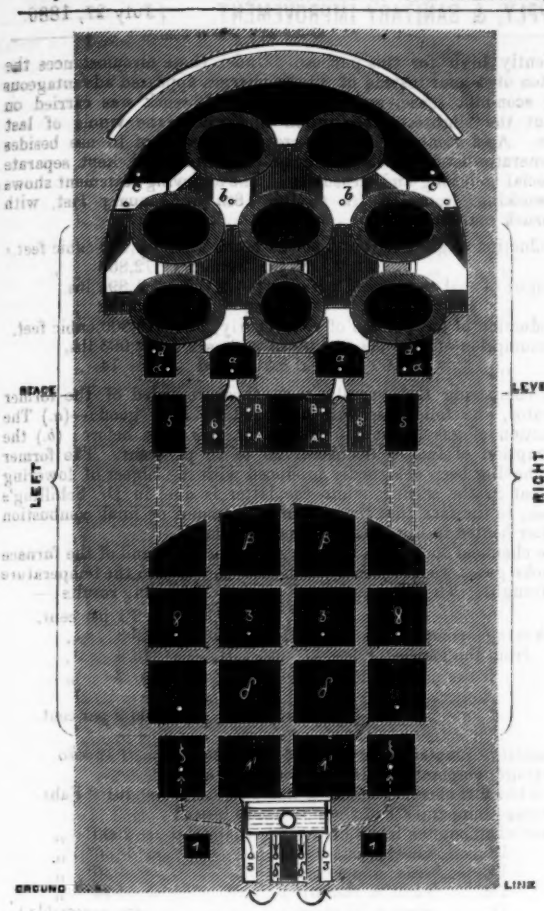
On comparing these results with those recorded of the former generator, the following will be found to hold good:—(*a.*) The production of gas is about 5·5 per cent. less than before; (*b.*) the consumption of fuel is decreased 20 to 26 per cent. The former result having been designedly produced with the object of lowering the heat in the setting, while the latter is due, in Dr. Schilling's opinion, to the fact that the air for the second or final combustion is better heated in the process of regeneration.

The chemical constitution of the generator gases and of the furnace or smoke gases was frequently examined, as was also the temperature and draught. These examinations gave the following results:—

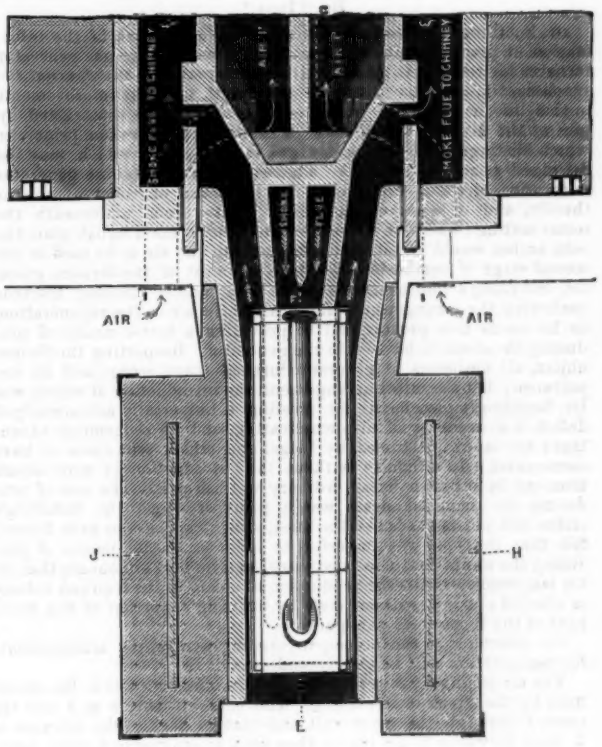
| | | |
|---|---|---|
| Average composition of the gas from the generator. | $CO_2$ | 9·1 per cent. |
| | CO | 19·8 ,, |
| | H | 13·9 ,, |
| | N | 57·2 ,, |
| | | 100·0 per cent. |
| Quantity of water admitted per kilo. of coal | | 0·72 kilo. |
| Average temperature of the heating gas taken in the flue close to the generator | | 2010° Fahr. |
| Average temperature of the previously heated air when passing from channel 5 to channel 6 | | 2000° ,, |
| Do. when in channel 4 | | 1150° ,, |
| Do. when in channel 3 | | 930° ,, |
| Do. when in channel 2 | | 930° ,, |
| Do. when in channel 1 | | (not accessible.) |
| Do. when entering through air-valve to channel 1′ | | 95° Fahr. |
| Average temperature of smoke gases on leaving the setting at $\alpha$ | | 2280° ,, |
| Do. when in flue $\beta$ | | (not accessible.) |
| Do. when in flue $\gamma$ | | 2010° Fahr. |
| Do. when in flue $\delta$ | | (not accessible.) |
| Do. when in flue $\delta'$ (under boiler) | | 1110° Fahr. |
| Do. when in flue $\epsilon$ | | 970° ,, |
| Do. when in flue $\zeta$ | | 930° ,, |
| Composition of the furnace gases on leaving the setting. | $CO_2$ | 18·6 per cent. |
| | CO | — ,, |
| | O | 1·2 ,, |
| | N | 80·2 ,, |
| | | 100·0 per cent. |
| Composition of the furnace gases on leaving the regenerator at $\delta'$ | $CO_2$ | 17·2 per cent. |
| | CO | — ,, |
| | O | 2·8 ,, |
| | N | 80·0 ,, |
| | | 100·0 per cent. |
| Draught under the generator fire-bars | | 0·10 inch. |
| Do. at outlet of generator | | 0·16 ,, |
| Do. at inlet of setting | | 0·10 ,, |
| Do. in setting above the slit at $a$ | | 0·06 ,, |
| Do. in setting at $c$ | | 0·10 ,, |
| Do. in smoke flues. | at $\alpha$ | 0·15 ,, |
| | at $\gamma$ | 0·18 ,, |
| | at $\delta$ | 0·28 ,, |
| | at $\delta'$ | 0·42 ,, |
| | at $\zeta$ | 0·60 ,, |
| Do. in air passages. | at 1 | 0·13 ,, |
| | at 2 | 0·04 ,, |
| | at 3 | 0·03 ,, |
| | at 4–5 | — ,, |
| | at 5–6 | 0·10 ,, |

On comparing these figures with those formerly recorded, the following differences will be noted:—(1) The air which was formerly heated in the regenerator to 1110° Fahr. only is now brought up to about 2010° Fahr. (2) The smoke gases which formerly passed out of the setting at 2010° Fahr., and in the regenerator were cooled down to 1470° Fahr., now pass out at 2280° Fahr., and leave the regenerator at about 930° Fahr. The previous heating of the air by the waste heat of the furnace gases has thus become more perfect.

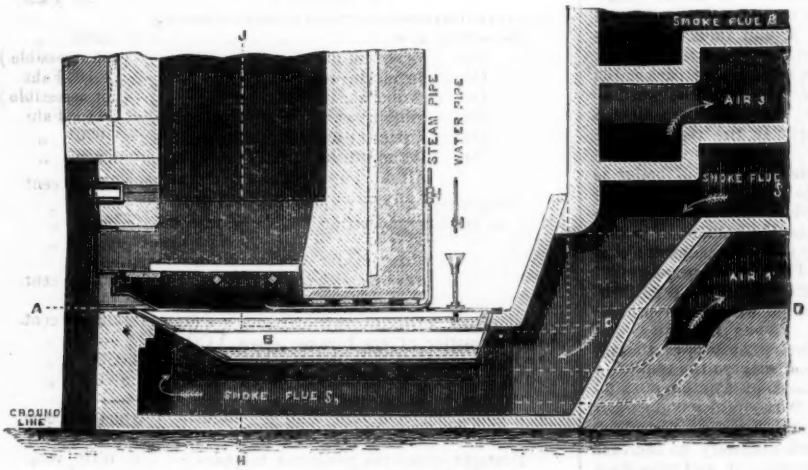
In the wages of the men employed in carbonizing a considerable economy has been secured. The cost for labour for seven generators is now 82·80 marks (about £4) per day of 24 hours, which is equal to about 11s. 6d. per setting. Assuming a production of 72,800



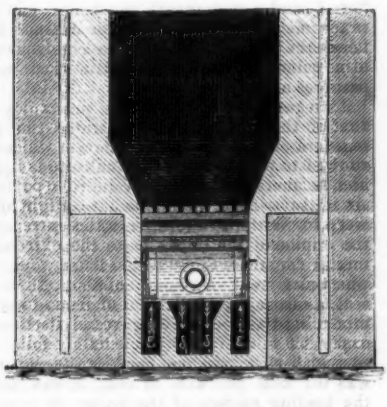

Sectional Elevation.




Section through A. B. C. D. (Ground Plan).




Section through E. F. G.



Section through J. H.

cubic feet per 24 hours, the cost for labour is therefore about 1·88d. per 1000 cubic feet of gas.

Respecting the cost of maintenance and other details of working, Dr. Schilling remarks that the generators have not required repairs of any kind. The walls are perfectly sound, and no perceptible wearing or melting away has gone on inside. Opposite the outlet gas-flue a larger sight-hole has been put in, to give readier access for cleaning. Fireproof lids instead of cast-iron covers have been fitted to the charging-mouths, and answer the purpose admirably. The walls of the regenerator have not required repair, all passages being perfectly free from dust, and the edges of the slit-stones or burners have preserved their sharpness. Last summer it became necessary to renew those retorts which had been in use from the commencement. They had been worked at very high heats, the front walls were slight, and the retorts were only supported in three places besides the back and front ends. The lowest bearing blocks (over the slits) of the middle retort had melted. The new setting gives four bearing blocks inside. The front wall is constructed with one brick outside, then a non-conducting lining 3¼ inches thick, and a half-brick wall inside. The back wall is two bricks thick, and in some settings, by way of experiment, it has another half-brick wall with a non-conducting lining. Hitherto no fault has arisen in the retorts, and the front and back walls have remained vertical. The deposit of carbon in the retorts is burnt off every two or three months, and is then not large, so that it is removable in about two hours. The dip in the hydraulic main is maintained at about ¾ inch.

*(To be continued.)*

## EXPLOSIVE MIXTURES OF COAL GAS AND AIR.

By Mr. W. Foster, M.A., &c.,
Professor of Chemistry at the Middlesex Hospital.

Second Article.

The first determinations of the velocity of flame in an explosive mixture of gases were made by Professor Bunsen, of Heidelberg. In the case of a mixture of oxygen and hydrogen in the proper proportions for complete chemical combination, the velocity of the transmission of flame through the mass of the mixture was found to be 37 yards per second, whilst in the case of a mixture of carbonic oxide and oxygen in their proper proportions, the velocity was less than a yard per second. Professor Bunsen further found that when such explosive mixtures were diluted with a gas which did not take any part in the combustion, or when there was an excess of either gas in the case of each of the simple mixtures just referred to, the velocity of propagation of the flame was diminished. The method of experiment adopted in these investigations was to force the explosive mixture from a reservoir through a long, narrow tube. The velocity of the gas stream was observed when it was just

sufficient to maintain the position of the flame constant with reference to a point in the side of tube. More recently Professor Mallard, of the French School of Mines, has extended this inquiry. He has made a number of experiments in a manner similar to that of Professor Bunsen, using mixtures of marsh gas (fire-damp) and air, and coal gas and air, in different proportions. We have already seen that 2 volumes of marsh gas require 4 of oxygen for complete combustion, therefore 1 volume requires 10 of atmospheric air to effect the same purpose. It is an interesting fact that the velocity of transmission of flame in such a mixture is less than the maximum possible. It was found that a mixture of 1 volume of marsh gas and 8½ of air gave the highest velocity, and this was a little more than half a yard per second. With mixtures of coal gas and air the velocity of transmission of flame is greater than with mixtures of marsh gas and air. This result would be anticipated on a consideration of the composition of coal gas and the results obtained by Professor Bunsen, which have just been referred to. Common coal gas contains about half its volume of hydrogen, and therefore its chief component, when mixed with air, furnishes a mixture the rapidity of inflammation of which is very high—in fact, much higher than that of a mixture produced by any one of the other components of coal gas and air. But in all the cases of explosive mixtures now under notice there is a relatively large quantity of inert gas present—namely, nitrogen—which diminishes the rate of inflammation, as shown by Professor Bunsen. In M. Mallard's experiments on mixtures of coal gas and air, he found that with the particular sample of coal gas employed, the maximum rapidity of inflammation occurred with a mixture consisting of 1 volume of coal gas and 5 of air. This gave a velocity of rather more than a yard per second. In a published lecture by Dr. Thorpe, of Leeds, on the theory of the Bunsen lamp, a summary of M. Mallard's observations is given. I have taken the liberty of expressing the mètres of the original table as yards:—

| Volumes of Air mixed with One Volume of Coal Gas (Composition not given). | Rapidity of Inflammation in Yards per Second. |
|---|---|
| 6½ | 0·308 |
| 6 | 0·672 |
| 5½ | 0·893 |
| 5¼ | 1·073 |
| 5 | 1·100 |
| 4¾ | 1·019 |
| 4½ | 0·806 |
| 3½ | 0·105 |

It is obvious from a perusal of this table that the velocity of propagation of flame in explosive mixtures of coal gas and air may vary very considerably. When the mixture consists of 1 of coal gas to 7 of air, we may safely consider the velocity as being not greater than a foot per second; whereas if the mixture consists of 1 of gas to 5 of air, there would be a velocity of not less than 3 feet per second.

Let us now consider the bearing of these principles on every-day practice. Suppose an explosive mixture (1 of coal gas to 7 of air) to be placed in a suitable vessel, and in communication with the external atmosphere by means of a cylindrical pipe several feet (say 6) in length, and further suppose that the internal diameter of the pipe is half an inch. If the pressure of the explosive mixture be the same as that of the atmosphere, but little of the former will escape into the external atmosphere. That portion which does escape is due, firstly, to the fact that the explosive mixture is lighter than atmospheric air; and, secondly, to the superior diffusive power of the explosive mixture. At the most there would be but a slight smell of gas if an observer were to place his nose close to the extremity of the open pipe. On the application of a flame to the extremity of the open pipe, the mixture would ignite, and the flame would traverse the length of the pipe quietly with a velocity of about three feet per second. In two seconds from the application of flame to the open pipe the explosive mixture in the containing vessel itself would be ignited, and an explosion would almost immediately follow, the character and extent of which would be modified by the shape of the containing vessel and the total volume of the explosive mixture.

Now let us suppose that the explosive mixture in the vessel has a pressure which is greater than that of the atmosphere, and that this pressure is maintained constant by artificial means. The escaping mixture can be ignited as before; but whether it will give rise to an explosion in the containing vessel, or not, depends on the velocity of the gas stream along the ½-inch pipe. If the velocity be anything greater than 3 feet per second, the explosive mixture in the vessel will not be ignited; but if the velocity be anything less than 3 feet per second, the flame will pass down the pipe with a velocity which is the difference between the two velocities—namely, that of the transmission of flame by the explosive mixture, and that of the gas stream along the pipe. If the velocity of transmission of flame be 3 feet per second, and the velocity of the explosive mixture along the pipe and at its external orifice be 2 feet per second, then the velocity of the flame with reference to the sides of the cylindrical pipe will be 1 foot per second, and, consequently, it will require six seconds for the transmission of flame from the external orifice of the pipe to the mass of explosive mixture in the containing vessel. We can therefore express the behaviour of explosive mixtures in a general way by saying *that so long as the velocity of the explosive mixture at the point or points where it escapes into the atmosphere is greater than the velocity of transmission of flame through the explosive mixture, there will not be an explosion in the containing vessel on the application of flame to the above point or points.*

It will be as well if we now consider what is the velocity of a stream of gas in our ordinary arrangements for burning common gas. It is usual to consume it at the rate of 5 cubic feet per hour per burner. Some burners within my reach are attached to a metal pipe, the internal diameter of which is 2-8ths of an inch. Using the same factors as in our former calculations, the length of such pipe necessary to hold 5 cubic feet of gas is 184,000 inches, or 5111 yards. Dividing this number by 3600 (the number of seconds in one hour), we obtain 51 inches, or 4·2 feet, as the velocity of the gas stream per second in the pipe, when gas is consumed at the ordinary rate. But the orifice of the burner itself is much less than 2-8ths of an inch in diameter, and therefore the velocity of the escaping gas at this point must be something considerably greater even than 4·2 feet per second. It follows, therefore, that if in our ordinary domestic arrangements there should be an accumulation of an explosive mixture of gas and air through a defect in the pipes, or other unforeseen circumstance, there is no reasonable chance of the slightest danger arising from the application of flame to the explosive mixture escaping from the burner at the ordinary pressure. Were it otherwise, accidents might possibly occur.

We have now discussed at some length the conditions necessary to be maintained in order to prevent the ignition of explosive mixtures of gas and air in containing vessels when they are at the atmospheric pressure, as well as when they are at higher pressures. We have just seen that the possibility of danger chiefly consists in the pressure being so slight as to cause the stream of the explosive mixture to have less than a certain velocity. If, under these circumstances, the pipe be wide enough to allow combustion of the explosive mixture to keep up its own temperature of ignition, the explosive mixture in the containing vessel must eventually be ignited. Now, in ordinary practice the pressure of coal gas (we will not go so far as to say explosive mixture) may be determined roughly by the application of a light, and there is no doubt that this practice is often adopted. In the case of vessels which *may* contain mixtures of gas and air, the application of flame in the ordinary way is most dangerous, especially if the pressure inside the vessel be nearly the same as that of the atmosphere. In the absence of that which is to be determined by the test—namely, superior pressure, there is every probability of an explosion following the application of the test itself. In order that a flame may be applied as a test of the combustibility or otherwise of the gaseous mixture, or to roughly determine its pressure, it is necessary that the pipe or jet should be specially constructed. By diminishing the diameter of the pipe, so as to make it very small, we prevent the possibility of flame passing into the interior of the containing vessel, and in order to compensate for the small quantity of gas or explosive mixture passing outwards through such small pipe, it is necessary to arrange a number of these in the form of a bundle. A compound tube made up of a number of very narrow tubes would then permit of the escape of sufficient gas, or of the explosive mixture, at a very low pressure, and flame could then be applied to the external orifice to indicate the character of the escaping gas, without any danger of ignition of an explosive mixture in the containing vessel. Such an arrangement has long been in use for burning explosive mixtures of oxygen and hydrogen. A simpler arrangement, and one which can be easily constructed, consists of a piece of metal tube, upwards of an inch in diameter, and several inches in length, packed with carefully-cut discs of fine wire gauze. The discs must fit the internal part of the pipe accurately, otherwise their function will be imperfect. In either case flame cannot pass backwards under any circumstances so long as the bundle of metallic pipes or the cylinder packed with discs of wire gauze is kept at the atmospheric temperature.

We have now to consider the conditions favourable to the production of mixtures of coal gas and air, and the laws which regulate their formation. Taking common air as the standard substance, the specific gravity of common gas ranges between 0·4 and 0·5. We may therefore regard it as possessing half the density of atmospheric air. It has weight, as is implied by its specific gravity, and is therefore subject to the laws of gravitation, like all material substances. When it escapes in atmospheric air, it tends to ascend, and this arises from two circumstances—firstly, the coal gas is the lighter of the two substances; and, secondly, both coal gas and air are examples of a fluid body. The particles of a fluid are readily susceptible of change with reference to each other and to those of a second fluid when there are differences of specific gravity, or when pressure is applied, and the like. When a jet of unignited coal gas escapes in an ordinary way, the lighter gas particles ascend, in consequence of their freedom to move, not only with reference to themselves, but also with reference to those of atmospheric air. So far, therefore, as the laws of gravitation affect the gas and air particles, the former ascend to the upper portions of the apartment, displacing the heavier particles of air; and were there no other influence besides the laws of gravitation in operation, the gas particles would collect in the upper portio n of the apartment unmixed with air. As a matter of common observation, we know that this separation of gas and air into distinct layers does not occur; and, further, that when the gas and air particles are thoroughly mixed, either by natural processes or artificially, there is no separation of gas and air into two layers on allowing the mixture to remain at rest. The lighter gas particles do slowly mix with the heavier air particles in opposition to the law of gravitation, and in the course of time the former will be equally dispersed through the air of the apartment, supposing there to be no chance of escape for either gas or air. The lighter gas diffuses itself through the heavier air in obedience to certain laws. These we will next consider.

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The Directors of The Gaslight and Coke Company announce that, subject to audit, the accounts for the half year ended on the 30th ult. show profit sufficient for a dividend on the ordinary stock at the rate of 11 per cent. per annum.

# Parliamentary Intelligence.

## PRIVATE BILLS RELATING TO GAS, WATER, Etc.

Session 1880.

Progress made to Saturday, July 24.

| Title of Bill. | | Petition for Bill Presented. | Bill Read the First Time. | Bill Read a Second Time. | Bill Reported. | Bill Read the Third Time. | Bill Received Royal Assent. |
|---|---|---|---|---|---|---|---|
| Ackworth, Featherstone, Purston, and Sharlston Gas Bill | Lords | Comns. Bill | June 25 | July 5 | July 15 | July 20 | .. |
| | Commons | Feb. 9 | Feb. 10 | March 8 | June 15 | June 24 | .. |
| Birkenhead Borough Bill | Lords | Bill with- | drawn. | | | | |
| | Commons | | | | | | |
| British Gaslight Company, Limited (Staffordshire Potteries), Bill | Lords | Feb. 10 | Feb. 10 | Feb. 23 | June 17 | June 22 | .. |
| | Commons | Lords Bill. | June 24 | July 5 | July 20 | .. | .. |
| Burton-upon-Trent Corporation Bill | Lords | Comns. Bill | May 27 | June 4 | July 23 | .. | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 16 | March 11 | May 25 | .. |
| Cardiff Water Bill | Lords | Feb. 10 | Feb. 10 | Feb. 20 | March 8 | March 11 | June 29 |
| | Commons | Lords Bill. | March 11 | May 31 | June 11 | June 15 | |
| Chester Gas Bill | Lords | Comns. Bill | March 12 | March 19 | June 4 | June 8 | June 29 |
| | Commons | Feb. 9 | Feb. 10 | Feb. 24 | March 2 | March 11 | |
| Cork Gas Bill | Lords | Bill with- | drawn. | | | | |
| | Commons | Feb. 9 | Feb. 10 | March 1 | June 18 | | |
| Cork Improvement Bill | Lords | Comns. Bill | June 25 | July 5 | July 15 | July 19 | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 16 | June 15 | June 24 | .. |
| Dagenham and District Farmers (Optional) Sewage Utilization Bill | Lords | Comns. Bill | July 9 | July 16 | July 23 | .. | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 17 | June 15 | July 8 | .. |
| Dartford Gas Bill | Lords | Comns. Bill | July 15 | July 23 | .. | .. | .. |
| | Commons | Feb. 9 | Feb. 10 | March 15 | July 6 | July 15 | .. |
| Dearne Valley Water Bill | Lords | Feb. 10 | Feb. 10 | Feb. 16 | March 16 | May 25 | .. |
| | Commons | Lords Bill. | May 28 | June 15 | June 22 | July 5 | .. |
| Denton and Haughton Gas Bill | Lords | Comns. Bill | June 1 | June 10 | June 18 | June 22 | June 29 |
| | Commons | Feb. 9 | Feb. 10 | Feb. 16 | March 17 | May 31 | |
| Doncaster Corporation Water Bill | Lords | Feb. 10 | Feb. 10 | Feb. 16 | March 16 | May 25 | June 29 |
| | Commons | Lords Bill. | May 28 | June 8 | June 22 | June 25 | |
| Eastbourne Gas Bill | Lords | Comns. Bill | May 27 | June 8 | June 24 | June 28 | July 9 |
| | Commons | Feb. 9 | Feb. 10 | Feb. 25 | March 12 | May 25 | |
| Edinburgh and District Water Bill | Lords | Feb. 10 | Feb. 10 | Feb. 16 | Feb. 26 | March 2 | June 14 |
| | Commons | Lords Bill. | March 5 | March 15 | June 1 | June 10 | |
| Exmouth and District Water Bill | Lords | Comns. Bill | June 25 | July 5 | July 8 | July 12 | July 19 |
| | Commons | Feb. 9 | Feb. 10 | Feb. 23 | June 11 | June 24 | |
| Gaslight and Coke, Commercial Gas, and South Metropolitan Gaslight and Coke Companies Bill | Lords | Comns. Bill | July 19 | .. | .. | .. | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 17 | July 9 | July 19 | .. |
| Great Yarmouth Water Bill | Lords | Comns. Bill | July 6 | July 15 | July 19 | July 22 | .. |
| | Commons | Feb. 9 | Feb. 10 | March 1 | June 25 | July 5 | .. |
| Hinckley Local Board Gas Bill | Lords | Comns. Bill | July 8 | July 19 | .. | .. | .. |
| | Commons | Feb. 9 | Feb. 10 | March 8 | June 29 | July 8 | .. |
| Huddersfield Tramways and Improvement Bill | Lords | Comns. Bill | June 25 | July 5 | July 8 | July 12 | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 16 | June 14 | June 24 | .. |
| Hull Lighting Bill | Lords | Comns. Bill | June 29 | July 9 | July 19 | July 23 | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 16 | June 11 | June 28 | .. |
| Hyde Gas Bill | Lords | | | | | | |
| | Commons | Feb. 9 | Feb. 10 | Feb. 23 | June 14 | Preamble | not proved. |
| King's Lynn Corporation Bill | Lords | Comns. Bill | July 6 | July 15 | July 22 | .. | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 16 | June 9 | July 5 | .. |
| Lancashire County Justices (Water, &c.) Bill | Lords | Feb. 10 | Feb. 10 | Feb. 16 | March 11 | March 13 | June 29 |
| | Commons | Lords Bill. | March 16 | June 7 | June 15 | June 24 | |
| Lancaster Corporation Bill | Lords | Comns. Bill | June 18 | June 28 | July 6 | July 9 | July 19 |
| | Commons | Feb. 9 | Feb. 10 | Feb. 16 | March 12 | June 18 | |
| Lincoln Gas Bill | Lords | Comns. Bill | June 22 | July 6 | July 13 | July 16 | July 19 |
| | Commons | Feb. 9 | Feb. 10 | March 12 | June 8 | June 21 | |
| Liverpool Corporation Water Bill | Lords | Comns. Bill | July 8 | July 19 | July 22 | .. | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 24 | July 1 | July 8 | .. |
| Liverpool United Gas Bill | Lords | Comns. Bill | May 28 | June 7 | July 19 | .. | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 24 | March 12 | May 27 | .. |
| London Gaslight Company Bill | Lords | Comns. Bill | June 29 | July 8 | July 15 | July 19 | .. |
| | Commons | Feb. 9 | Feb. 10 | March 1 | June 17 | June 28 | .. |
| Maidstone Gas Bill | Lords | Comns. Bill | July 2 | July 12 | July 15 | July 19 | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 23 | June 22 | July 1 | .. |
| Malton Gas Bill | Lords | Comns. Bill | June 25 | July 5 | July 8 | July 12 | July 19 |
| | Commons | Feb. 9 | Feb. 10 | March 8 | June 11 | June 24 | |
| Oldham Improvement Bill | Lords | Comns. Bill | July 6 | July 15 | July 22 | .. | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 16 | June 17 | July 5 | .. |
| Phœnix Gaslight and Coke Company Bill | Lords | Bill with- | drawn. | | | | |
| | Commons | | | | | | |
| Portmadoc Water Bill | Lords | Feb. 10 | Feb. 10 | Feb. 16 | May 31 | June 3 | .. |
| | Commons | Lords Bill. | June 4 | June 14 | July 16 | July 20 | .. |
| Prescot Gas Bill | Lords | Comns. Bill | May 28 | June 7 | June 14 | June 17 | June 29 |
| | Commons | Feb. 9 | Feb. 10 | Feb. 23 | March 12 | May 27 | |
| Preston Improvement Bill | Lords | Comns. Bill | June 25 | July 5 | July 16 | July 20 | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 16 | June 15 | June 25 | .. |
| Rathmines and Rathgar Township (Vartry Water Supply) Bill | Lords | Feb. 16 | Feb. 16 | March 11 | June 7 | Preamble | not proved. |
| | Commons | | | | | | |
| Rathmines and Rathgar Township Water Bill | Lords | Feb. 10 | Feb. 10 | Feb. 16 | June 7 | June 14 | .. |
| | Commons | Lords Bill. | June 18 | June 29 | .. | .. | .. |
| Reading Gas Bill | Lords | Comns. Bill | June 29 | July 8 | July 15 | July 19 | .. |
| | Commons | Feb. 9 | Feb. 10 | March 1 | June 17 | June 28 | .. |
| Rochester Corporation Bill | Lords | Comns. Bill | July 9 | July 23 | .. | .. | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 16 | July 2 | July 9 | .. |
| Sea Water Supply to London Bill | Lords | Feb. 10 | Feb. 10 | Feb. 16 | March 2. | Preamble | not proved. |
| | Commons | | | | | | |
| Sligo Borough Water Bill | Lords | Feb. 10 | Feb. 10 | Feb. 16 | June 11 | June 15 | .. |
| | Commons | Lords Bill. | June 17 | June 28 | July 20 | July 23 | .. |
| South Metropolitan Gas Company Bill | Lords | Bill with- | drawn. | | | | |
| | Commons | Feb. 9 | Feb. 10 | | | | |
| Southwark and Vauxhall Water Bill | Lords | Bill with- | drawn. | | | | |
| | Commons | Feb. 9 | Feb. 10 | Feb. 23 | | | |
| Stafford Borough Bill | Lords | Comns. Bill | June 3 | July 1 | July 5 | July 9 | July 19 |
| | Commons | Feb. 9 | Feb. 10 | Feb. 23 | March 17 | June 1 | |
| Wakefield Corporation Water Bill | Lords | Feb. 10 | Feb. 10 | Feb. 16 | March 11 | March 16 | July 9 |
| | Commons | Lords Bill. | March 18 | June 7 | June 25 | July 7 | |
| Wandsworth and Putney Gas Bill | Lords | Comns. Bill | June 25 | July 5 | July 6 | July 9 | July 19 |
| | Commons | Feb. 9 | Feb. 10 | March 2 | June 8 | June 24 | |
| Wigan Improvement Bill | Lords | Comns. Bill | June 25 | July 5 | July 19 | July 23 | .. |
| | Commons | Feb. 9 | Feb. 10 | Feb. 17 | June 11 | June 24 | .. |
| Wrexham Water Bill | Lords | Comns. Bill | June 22 | July 1 | July 2 | July 6 | July 19 |
| | Commons | Feb. 9 | Feb. 10 | March 4 | June 11 | June 21 | |
| Yeadon and Guiseley Gas Bill | Lords | Comns. Bill | June 25 | July 5 | July 12 | July 15 | .. |
| | Commons | Feb. 9 | Feb. 10 | March 10 | June 11 | June 22 | .. |

## HOUSE OF LORDS.

MONDAY, JULY 19.

GAS AND WATER ORDERS CONFIRMATION BILL.—This Bill received the Royal Assent by Commission.

TUESDAY, JULY 20.

The Liverpool Corporation Water Bill was referred to a Select Committee, consisting of Lord Emly (Chairman), Viscount Sherbrooke, Lord Inchiquin, Lord Gormanston, and Lord Trevor; to meet on Thursday, July 22.

THURSDAY, JULY 22.

The Chairman of the Select Committee on the Liverpool Corporation Water Bill reported that the Committee had not proceeded with the consideration of the Bill, having found that the petitioners had no *locus standi* before them.

The Chairman of the Select Committee on the Dagenham and District Farmers (Optional) Sewage Utilization Bill reported that the Committee had not proceeded with the consideration of the Bill, the opposition thereto having been withdrawn.

## HOUSE OF COMMONS.

TUESDAY, JULY 20.

A requisition to withdraw his petition against the Rathmines and Rathgar Township Water Bill (Lords) was presented from Edward Cecil Guinness.

### THE LIGHTING OF THE BRITISH MUSEUM.

Mr. D. GRANT asked the right honourable member for Cambridge University (Mr. Walpole), as one of the Trustees of the British Museum, whether arrangements for lighting could be made by which our great national collection, or the main portion of it, could remain open to the public until ten o'clock at night every week day throughout the year.

Mr. WALPOLE said he was sorry he could not at present give such a favourable answer to the question as he could wish to do. The proposal had been before the Trustees on more than one occasion, and they had always found, on consultation with the highest and best authorities, that the use of gas would be very injurious to some of the collections. They had, therefore, never been able to see their way to sanction the lighting of the Museum with gas to any extent; but it was possible the time might come when the use of gas could be effectually superseded by the electric light. Some experiments had been made in this direction last winter; but, so far, they did not seem to justify the extension of the electric light to certain parts of the building. The matter, however, might be left in the hands of the Trustees, who, he believed, would take the earliest opportunity of giving it their best consideration.

## HOUSE OF COMMONS COMMITTEE.

MONDAY, JUNE 21.

(*Before Mr.* DODDS, *Chairman; Mr.* SCHREIBER, *Mr.* J. M'CARTHY, *and Mr.* NORTHCOTE; *Sir* JOHN DUCKWORTH, *Referee.*)

### MAIDSTONE GAS BILL.

(*Concluded from page* 100.)

Mr. *Hawksley* recalled, and further cross-examined by Mr. MICHAEL.

I produce a statement, prepared from official returns, showing the illuminating power prescribed and yielded; the limit of sulphur prescribed, and the maximum, minimum, and average quantities yielded; together with the cost of purification of the gas supplied from the Beckton works of The Gaslight and Coke Company from November, 1873, to November, 1879. [The return showed that the maximum of sulphur allowed was either 20 grains or 15 grains, according to the season; the average quantity actually found ranged from 14·58 grains in November, 1873, to 9·1 grains in May, 1878. The standard of illuminating power during the whole of the period was 16 candles, the average of that actually obtained ranging from 18·49 in August, 1875, to 16·40 in November, 1875. The cost of purification in November, 1873, was 0·88d. per 1000 feet. In the year 1874 it was 1·05d.; 1875, 1·01d.; 1876, 1·14d.; 1877, 0·96d.; 1878, 1·03d.; and 1879, 1·2d.]

Mr. MICHAEL: There is one matter to which I must direct your attention. Where did you ever purify gas from sulphur compounds, and use first oxide of iron in order to take out the sulphuretted hydrogen, and then purify by lime afterwards for the purpose of getting rid of the sulphur compounds and the carbonic acid?

*Witness:* Wherever the two have been used together. The other course, though it produces a better chemical effect, is a nuisance, and ought not to be adopted. The former method has been adopted in Sunderland, Cambridge, and Nottingham.

You first use oxide of iron?—First we use oxide of iron to remove the offensive element of the gas—the sulphuretted hydrogen—and then the gas passes on to the lime, which acts perfectly in removing the bisulphide of carbon, as it is commonly called, to within very much less than 20 grains—down to as little as 10 grains—if necessary, and it takes out all the carbonic acid. But what is necessary to be provided against in this mode of treatment is, that there shall be enough lime to take out the carbonic acid in the first lime vessel, and enough lime in the subsequent lime vessel to catch the displaced bisulphide of carbon. I have carried out that process in various places at an ordinary cost of about 1d. per 1000 feet, and generally with one set of purifiers.

I will ask you a chemical question. When you have taken out the sulphuretted hydrogen by means of oxide of iron, and transferred that gas to the lime, what is it that takes out the sulphur compounds?—The lime itself; or indeed any alkali will do it.

Are you aware that you alone, among all chemists and engineers, hold this view?—I am quite sure that I am not alone. But what is better than my opinion is, that I do it. It is not at all necessary to have the sulphide of calcium in the first vessel, although it is a little cheaper.

If so simple a process is immediately at hand, avoiding the possibility of nuisance, can you give me any reason why, after all this trouble and agitation, the London Companies have not adopted it?—The London Companies, both gas and water, are, in many respects, a long way behind many people in the provinces.

There has been a great difficulty experienced by the London Gas Companies with respect to this question of sulphur, has there not?—There has been no difficulty at all, except that which arose from having a bad arrangement of apparatus, and uninstructed people to work the purifiers. It can be done easily and cheaply, with advantage to the companies as well as to the public.

We had the pleasure of seeing here for several days Mr. Vernon Harcourt, one of the Metropolitan Gas Referees; do you consider him an authority on the matter?—Yes; but if Mr. Vernon Harcourt were to say that what I am doing every day could not be done, I should call him a negative authority. He is not a practical gas-maker.

Would you also say that Mr. Harcourt's idea as to the cost of purifying from 40 to 20 grains is negative?—I cannot see how Mr. Harcourt can have any well-formed opinion upon the subject, because he is answered by the table I have put in, which shows that 1d. per 1000 feet, or thereabouts—both before and after the passing of the Act to which you referred—has left the sulphur below 20 grains.

You know that Mr. Harcourt was examined on the Bills of the Crystal Palace and another Gas Company who sought to be relieved from the limited number of grains of sulphur?—Yes; and I was also examined, and the Companies lost on both Bills. This is the one subject from which I cannot exonerate the Companies in regard to their conduct.

We know all about your hogshead of sulphuric acid?—My own office will produce a hogshead of very strong liquid, containing sulphuric acid and the condensed moisture formed by the combustion of coal gas.

Do you provide in your office any means for the exit of the air which has been burned?—It was in consequence of providing those means that I made the discovery, because I led away a pipe from the burner for the purpose of taking off the products of combustion. That pipe condensed the moisture which was formed during combustion, and I found that the water was particularly acid.

That is, you had a pipe and something in the nature of a trumpet-mouth over each burner, and so carried away the products of combustion?—Yes; carried them into a chimney, instead of allowing them to foul the air of the room.

If you had not provided the means of entrance for air as well as exit for it, you would not have had the products of combustion so carefully removed, would you?—The air was the air of the room, coming in through doors, windows, ventilators, and other openings provided in the office.

I understand you to say that three days average is of so little value as to nullify the whole of the procedure?—Yes; the three days ought not to be granted in any places where there are not authorities similar to those in the Metropolis, where you have not only a Gas Examiner, but also three Gas Referees, and over them an appellate judge, while in the country there is nothing of the kind.

Therefore it is very much harder on provincial gas companies. You have destroyed the whole value of your argument because you have argued from my point of view. In the country there is no appellate jurisdiction, while in town there is, and therefore if a London company fail on one day in the matter of sulphur purification, they may go before that appellate jurisdiction and say, "From unavoidable or accidental causes this has happened?"—There is more behind all this. In The Gaslight and Coke Company's Act of 1876 they obtained the insertion of that particular clause about the three days. I did not give evidence upon the Bill—I wish I had—but it is very important to know, in connection with it, that the Gas Referees have the power of fixing from time to time what shall be the amount of sulphur impurity; and since the passing of the Act the Referees have fixed the impurity in summer as low as 15 grains.

That is suburban?—Beckton is the largest gas-works in the world, and supplies all London.

By the CHAIRMAN: The Referees have fixed the impurity at Beckton at 15 grains in the summer, and 20 in the winter; and it will be found that during every day since the passing of the Act, the Company have kept within the limits prescribed by the Referees, and that has been done at the cost of 1d. per 1000 feet, in round numbers.

Mr. MICHAEL: Is it not the fact that when the Metropolis Gas Bill was introduced in 1875, it was without the average of three days clause?

*Witness:* I cannot tell you.

Mr. MICHAEL said it was not in the Bill as introduced, but abandoned. It was, however, followed in the Commercial Company's Act, which was passed by Mr. Forster's Committee as the result of the general investigation. The 38th clause in the Act said "the average of all the testings of illuminating power and pressure prescribed under this Act on each day shall be deemed to represent the illuminating power and pressure respectively on that day;" and the 39th clause stated that "the average of all the testings of purity prescribed under this Act on three successive days shall be deemed to represent the purity on each of such days." This was all that was now asked for. The Company agreed to the 20 grains, and asked to be protected in the same way as the Commercial and other Metropolitan Gas Companies were.

The CHAIRMAN: Mr. Hawksley rather draws a distinction between metropolitan Acts and those relating to places in the country. He says that in the Metropolis there is, first, the Gas Examiner, then the Gas Referees, and then the judge.

Mr. MICHAEL: All that is in favour of the Gas Company, because it gives them a bridge to help them over a difficulty. (To witness:) Is it not the fact that coals differ very considerably not only as to the quantity of sulphur, but also as to the sulphur compounds contained in them?

*Witness:* Yes; there is a considerable difference in coals, but not so much in regard to sulphur compounds other than those which produce sulphuretted hydrogen. Commercial coals will contain from 1 to 2 per cent. There is twice as much sulphur in one kind of coal that there is in another, it being very often in compounds not yet found by chemists.

Therefore, you may one day be operating on one sample of coals, and on the next day, without any warning, be operating on a sample entirely different, as regards sulphur compounds, both as to quantity and quality?—That is so, but every gas engineer learns to know how he is to treat the gas produced from coals which are ordinarily sold in the market for gas-making purposes.

Do you mean the Committee to understand that you, with all your practical experience, can put on this side a ton of coals, and on that side a ton of coals, and be able to tell, before you have made the gas, what quantity of sulphur there will be in each?—Yes; entirely so, if I am experienced in the use of those coals.

I mean from the aspect of the coal itself?—No. I know whether it is Pelaw, or South Hetton, or any other description of coal which is ordinarily purchased in the market. But it all comes to the point that I have no difficulty in keeping the sulphur of any coal down within 20 grains per 100 feet of gas.

You differ from everybody else in having no difficulty, when they experience very considerable difficulty?—You assume that. I can only say this: Let them go to one of my works, and let me go to their works, and I dare say I shall have bad gas in my works under their bad management, and I shall make good gas in their works under my management. It is not the man who cannot do the thing, but the man who can do it, who is to be regarded.

Is the testing for sulphur compounds so very certain?—No; but the mode of preventing the introduction of sulphur compounds is the simplest thing in the world.

Let us come to another matter—namely, the differential price of 1s. per 1000 feet, proposed to be charged within the new limits prescribed by the Bill. Do you think it fair, in the interests of the consumers in Maidstone, that this differential charge should be inserted in the Act?—I do, and I do not. I think, and I know by experience, that the additional cost is about 3d. for every mile of distance. This 3d. arises partly by reason of the increase of capital and partly by the increase of leakage; and the two together require, in order that justice should be done to both parties, that beyond a certain limit—which may differ in every case according

to the particular boundaries beyond that limit—the price of gas ought to be augmented 3d. a mile.

We are told by the petition of the Corporation that whereas at the present time the limit is between three and four miles, by adopting the new limit the farthest point will be six miles, and therefore I may take it to be an extra distance of 2½ miles. In order to prevent any injury to the consumers at Maidstone, it is proposed that there should be a differential charge of 1s. in order that gas might be so supplied as not to prevent the operation of the Gas-Works Clauses Act, 1847. Do you think that this differential charge of 1s. is fair?—Not if reckoned in that way; but you have done the thing in a very crude manner. It might be very considerably improved by a simple clause. The Corporation of Maidstone are willing to agree to a standard price of 3s. 6d.—though that is unnecessarily high—to extend within the limits of one mile from the Town Hall, and my proposition would be a price of 3s. 9d. between one and two miles.

Supposing, however, those zones were not adopted, it would not cause any injury to accrue to the consumers of Maidstone?—There would be no injury.

What is your experience as to the expenditure of capital? Do gas companies under the auction clauses unnecessarily expend money?—Sometimes they do, and occasionally it has the effect of narrowing the expenditure; it depends upon the particular position of each company.

Will you tell me shortly, as a general principle, what is the inducement, and what must be the condition of a company under the auction clauses to lead to such an inducement to expend unnecessary capital?—I can very easily answer that. Supposing a company is making profits so very considerable, that it cannot, even under these clauses, without exciting a good deal of disapprobation, appropriate those profits, then one inducement is to lay out a very considerable sum of money in order to enable it to appropriate profits at a moderate rate of dividend.

Is it not essential to the carrying out of such inducement that they should be making more than their maximum statutory dividend?—There is no maximum statutory dividend in this case; it is a standard price simply, and a standard dividend, from which departures are to be made.

The maximum statutory dividend is, under the sliding scale, changed to a dividend proportioned to price?—Inversely in proportion to price.

There was a time when the Company had a maximum statutory dividend, before they came to Parliament and obtained the auction clauses?—Yes.

Therefore they must at that time have had a dividend earned beyond what they were competent to divide under the Gas-Works Clauses Act, before they would have any inducement whatever to expend unnecessary capital?—The inducements are so numerous; but if you put the money inducement merely, that is so.

Is there any such inducement in this Company to have had a deficit of 1·40d. per 1000 feet sold in the last year—that is, they have not made up their maximum statutory dividend by 1·40d.?—You keep putting upon me facts which I have a difficulty in accepting. I do not think they have lost that.

I put it frankly and fairly to you, that in the working of the Maidstone Gas Company last year they did not pay their maximum statutory dividend by 1·40d.; they did not earn it, and therefore they could not pay it unless they took it out of their reserve-fund?—I do not admit that; I say they did earn it, and they appropriated part of the money in another way, in lieu of capital.

Do you think that there would be any inducement for this Company to expend capital unnecessarily?—The question is so invidious that I do not like to answer it.

Is it an unfair thing for a gas company to provide insurance and reserve funds?—I think the reserve-fund under the Gas-Works Clauses Act is sufficient for all purposes.

Are you not aware that this has ceased to act altogether under the provisions of the sliding scale?—I know that in your case it has not ceased to act. You have incorporated the Gas-Works Clauses Act without exception, and the words which a common reader would suppose took it out, do not take it out.

Is not it the fact that in the present Bill, as in all Bills with the sliding scale, there is a provision that, besides dividing the profits, the Company may, out of revenue, lay aside year by year a sum equal to 1 per cent. upon the paid-up capital of the Company?—I think not; but in many Bills there are such provisions.

Do you think it improper that there should be such a fund provided?—*If* there is no other reserve-fund, I think it is right; but if there is also a 10 per cent. reserve-fund under the Gas-Works Clauses Act, I think it is entirely wrong.

Do you not know that this has been entirely swept away by the present Bill, and other provisions made with respect to it?—I do not know it, and I do not believe it has.

Is it not the fact that under the Gas-Works Clauses Act you could have your maximum profits and a reserve-fund equal to 10 per cent. upon your nominal capital?—Yes; but not out of capital; it is to be out of profits.

It is to be the profits you might divide, *plus* a reserve-fund?—You have got it all wrong still. If you refer to the governing clause, and take that in conjunction with clause 17, you will see there is no repeal of the Gas-Works Clauses Act.

If you read section 19, you will see that the Gas-Works Clauses Act, with respect to the reserve-fund, is entirely repealed?—I think differently, and I adhere to my opinion.

Re-examined by Mr. KINGSFORD: If Mr. Spice said that gas should be passed through oxide of iron first and lime afterwards, he was quite right. I have prepared a list of Acts of Parliament containing the 20 grains clause. [Handed in.]

Mr. MICHAEL contended that it was not a fair statement of the legislation during the past few years, because in many cases the limit was 30 grains.

Mr. KINGSFORD said the circumstances of those cases might differ very considerably.

*Witness* said this was the case.

Re-examination continued: The three days average clause would necessitate a daily testing, to which I see no objection.

Mr. MICHAEL said a penalty was asked for on every day; therefore how could a daily testing be avoided?

Mr. KINGSFORD: If you test on any day, and find the amount of impurity exceeds the quantity allowed, then by the terms of the clause you must take the testing of the preceding and following days; so that if you went on Monday and found 30 grains, it would be no good unless you could show what was the testing on the Sunday?

*Witness:* That is so.

By the CHAIRMAN: The Referees prescribe 20 grains in winter and only 15 in summer, because in summer the purifiers are proportionately larger, having reference to the quantity of gas sent through them, than they are in winter. The cost in winter might be a little more than in summer, but 1d. per 1000 feet would be the average for the year.

Mr. KINGSFORD said, from the course the inquiry had taken, and the limit of 20 grains being admitted, the evidence of several witnesses who were to have been called to prove complaints made to the Local Board, and other matters, became unimportant, and the Committee would not be troubled with them.

This was the case for the petitioners.

Mr. MICHAEL, in replying upon the whole case, said he felt very much surprised that Mr. Harcourt, Dr. Frankland, and Mr. Heisch, who had been waiting to give evidence, had not been called. Mr. Hawksley was not only at variance with every other authority in the matter of purifying, but, great as he was as an engineer, he had shown himself most lamentably deficient in the first principles of chemistry, and, therefore, the evidence of the gentlemen to whom he had referred might perhaps have been of some assistance to the Committee. It was all very well for Mr. Hawksley to say that if he were employed by any gas company he would set everything to rights, and make good gas in the place of bad gas; but he really had transgressed the limits of propriety in coming forward, and in a wholesale manner condemning all other gas engineers, stamping them as incapable, and saying that he was the only man who could turn out gas proper to be used by the citizens of London, or any other city or town. Virtually the parties had been fighting on a question which had practically been decided. The moment the Maidstone Gas Company gave in on the question of the 20 grains of sulphur, the whole thing ought to have fallen to the ground; but the Corporation had kept on arguing the question for two or three days after the Company had fallen on their knees and craved pardon for what they had done in the past, and promised to behave better for the future. And then, forsooth, the petitioners asked to be placed in a different and a better position from the gas consumers of the Metropolis; but why? Had there been any reason alleged except the extraordinary evidence of the gentleman who did not know the power of gas-burners, and who spoke to some unsanitary condition of gas differing between 14 and 16 candles, which he could not explain? Had there been any evidence to show that there was something so peculiar in the condition of the health or the morals of the inhabitants of Maidstone as to require gas of an entirely different character to that supplied in the Metropolis? Mr. Hawksley had acknowledged that, without the slightest warning, coals might differ so much both in the quality and quantity of sulphur they contained, that means which were efficacious on Monday would prove totally inefficacious on Tuesday. Mr. Forster's Committee were also satisfied that in the Metropolis, owing to the difficulties surrounding the question of the purification of gas, it was right not only to give the Companies three days, but also to give them the right of appeal to the Gas Referees, and also to the Chief Gas Examiner; so that if from stress of weather, or other unavoidable causes, a sudden rise occurred in the quantity of sulphur, they were to be held exempt, the onus of proof being laid upon them. The Maidstone Gas Company did not ask for anything of this kind; all they sought was that if from unavoidable circumstances, or from accident, there might happen to be on any one day a greater quantity than 20 grains of sulphur in their gas, they were to be free from penalty. Was this such a dreadful thing? A man used a gas-burner for five hours, consuming in this time 20 feet of gas, which would contain something less of sulphur than would be emitted by striking a lucifer match on a box. This was the quantity of sulphur which was so injurious to health, and made up Mr. Hawksley's hogshead of sulphuric acid, although that turned out to be a case where he had taken special means in order to condense the moisture given off from the union of the hydrogen and oxygen, which ran off into a little water. What was the value of such evidence as this?

The CHAIRMAN said it was merely a figure of speech.

Mr. MICHAEL said they were not dealing with the poetries and imaginations of science. A gas company was not an incorporeal hereditament—something existing in the air—but represented the investments of widows and orphans, clergymen, and people who had placed their money in an undertaking which they believed would bring them in a fair return; and if Parliament, with hogsheads of sulphuric acid floating before their eyes, carried round by some mesmeric influence, or some spiritual or other medium, were to act without proper cause being shown, to the injury of the persons who had so invested their money, what was to become of commercial enterprise throughout the country? A good deal had been said about the injury gas had caused to pictures, books, brasswork, and other things; but all this had been fought out, and it had been acknowledged that London was adequately protected by its being seen that gas did not contain more than 20 grains of sulphur per 100 cubic feet upon an average of three days testing. Was not this, which was good enough for the Metropolis, good enough for the inhabitants of Maidstone? The Gas Company also proposed to extend their limits, and Mr. Hawksley had entirely done away with any objection to this, because he had said that no injury could accrue owing to the differential price. It must also be remembered that if the Company acted improperly in supplying those outlying districts, or contrary to the interests of the gas consumers in Maidstone, they were as liable as ever, under the operation of the Gas-Works Clauses Act, to be brought to book, although practically this Act had been swept away by the introduction of the auction clauses and the sliding scale, because there was no inducement to the expenditure of further capital. With respect to price, Mr. Hawksley had brought the figure up to 3s. 6d. per 1000 feet; but the Company said it required 5d. to meet the additional capital they were bound to raise. They were already 1·40d. below the sum required to pay their maximum dividend, so that this also must be added; and there was another thing. Mr. Hawksley was totally ignorant of the operation of the insurance-fund, putting aside the reserve-fund altogether. Under the old state of things a gas company could not only divide 10 per cent., but whatever the nominal capital might be they were entitled to pay 10 per cent. upon it. When a new capital of, say, £100,000 was granted by Parliament, the gas company were entitled to lay by, by way of reserve-fund, 10 per cent. on that nominal capital, though only £10,000 might have been raised. As things stood now, however, the price of gas must be diminished before a single farthing could be laid aside in the shape of a reserve-fund; and at the same time, in addition to the sum of 7 per cent. which the Company were to have under the standard price, they were entitled to lay aside 1 per cent. upon their paid-up capital, raising it to 8 per cent. This, however, did not appear in the 3s. 6d. given by Mr. Hawksley; and the Committee were also asked to consider the number of different expenses to which a gas company were subject which could not be put down upon paper, and the number of holes in the pocket of a company through which money dribbled out before profit could accrue to the shareholders. Doubtless if Mr. Hawksley were Engineer to the Maidstone Gas Company, he would conduct the vessel into a port of prosperity where none of those outgoings would be necessary. He had added nothing for the 1·40d. short in the sum necessary for dividend last year, nothing for the insurance-fund, and nothing for what would be required in respect of the additional capital to be raised. The present was the first time he (Mr. Michael) had heard of capital springing up from the ground—coming up, like Jason's followers, ready armed, without any trouble on the part of the company. Mr. Hawksley then dealt with depreciations and renewals, which he said were to come out of capital; although he was obliged to admit that all money which had to be expended by a gas company for the renewal of that which previously existed must come out of revenue. It would be a gross injustice to the

consumers of Maidstone if, when a retort had ceased to be useful, they were to revert to capital for the renewal of that retort; or if, when a 6-inch pipe had to be replaced by a 10-inch pipe, or old premises had to be rebuilt, the expenses were charged to capital.

The CHAIRMAN said he thought Mr. Hawksley had put that matter right.

Mr. MICHAEL said Mr. Hawksley had struck down the Company's figure of 1s. 2d., over an average of 14 years, to 7d., and had referred, as a justification, to entirely new works existing in London. If he had taken other works of the same age as those at Maidstone, he would have found that 9d., 10d., and 11d. represented the proper figures. The price of coal and iron might so rise immediately, that it would be perfectly impossible for gas to be produced for anything like the price it was at present. The Committee were legislating for 12 years to come, and Counsel on the other side had acknowledged that the Company ought to have 4d. per 1000 to provide for matters beyond their control. An exceptional year ought not to be taken, and the Company be bound down to it. The careful attention of the Committee was next invited to the question of illuminating power, which the Corporation asked should be raised to 16 candles, although 14-candle gas was consumed in more than two-thirds of the United Kingdom. Mr. Hawksley said that if the consumers had 16-candle gas they would burn less of it, so that the light would be exactly the same, and therefore they would be content with exactly the same illuminating power as they now complained of. Besides Mr. Hawksley's evidence on this point, the Committee had that of a gentleman, who called himself a gas analyst, although not an analyst of burners, as if the whole matter of the illumination of a room did not depend on the fitness or otherwise of the burners employed. This gentleman seemed to have an idea that there was something miraculous and spiritual in the character of gas, which made it different from any other material, and that a burner might be made to misrepresent the illuminating power of the gas, and make it show one or two candles more than its absolute light-giving value. It was an insult to common sense to talk such nonsense. If the 16 candles were granted the Corporation would go back rejoicing, and say to the gas consumers, "What a victory we have gained over the Gas Company; we shall have 16-candle gas now, and have no more unsanitary conditions in Maidstone;" while all the time the great Gas Engineer who said he could revolutionize gas-making if he had it all under his control, said there would not be a particle of difference, because the consumers would burn the same quantity of gas as before. He (Mr. Michael) thought he had shown, out of the mouths of the witnesses for the Corporation, sufficient to justify a price of 4s. per 1000. He would not refer to the evidence which had been given by the promoters. The Committee might consider it as all being valueless; that Mr. Livesey was a gentleman who knew nothing, although he had raised the South Metropolitan Gas Company to the highest pinnacle to which a gas company could be raised; that neither Mr. Keates, nor Mr. Spice, nor Mr. Penny was a gentleman whose evidence was to be taken as being of any value; nor was the working of Mr. West (who was considered to have conferred a very great boon on gas companies by showing how a larger quantity of gas could be obtained from coal than had ever been done before) to count for anything; but, taking Mr. Hawksley's own figures, it must still be contended that 4s. per 1000 was a proper price to fix as a standard. With regard to the zones which had been referred to, there would be a difficulty in working them, and it was much more simple to have a charge of 4s. within a certain ambit, and another 1s. beyond, especially as Mr. Hawksley had said that no injustice could be done to Maidstone by this course. There was one other point, and that was settled by Mr. Hawksley's own evidence. With respect to the amount of capital required, he differed from the promoters, and said, in substance, "Instead of putting up a gasholder to contain half a million feet of gas"—which the Company said was necessary, and which was the economical way of doing it—"I would do it in two." The Maidstone Gas Company doubled their make in twelve years, and the Bill was to last that time; but Mr. Hawksley would put up a gasholder to last for seven years. Did not this thoroughly establish the Company's case? What advantage was it to the town to have at the end of seven years to apply for power to erect another gasholder? If the Corporation of Maidstone wished in seven years time to spend £3000 or £4000 in parliamentary expenses, it would not be because they wanted cheap gas, but because they wished for the opportunity of airing their grievances, and asking for things they were not entitled to receive. A gasholder was not a thing erected every day, and a quarter of a gasholder could not be put up; but Mr. Hawksley had made no provision for additional capital which would then be required. This gentleman had said over and over again that it was not judicious to be constantly applying to Parliament to reopen the same questions, and also that twelve years was a fair time for a company to take when asking Parliament for powers; and in the present case the Company were asking for this time. The only two things remaining which Mr. Hawksley objected to were the excess of the £5500 so far as the gasholder was concerned, and the £7000 for purifiers. As regarded the former, he said that a holder of the capacity of 250,000 cubic feet was sufficient to last for seven years, and at the end of this time a similar, if not larger quantity of storeage would have to be provided. As to the purifiers, at least another set was required, if not two sets more; but on this point nothing need be said, seeing that there had been several eminent gentlemen waiting to be called, who would have told the Committee that to pass gas through one series of purifiers only for the elimination of sulphur compounds was at variance with every principle of common sense, and too absurd to be argued upon. It was sufficient to say that in London it could not be done, but the Companies were obliged to adopt an entirely different plan; and because they could do it for 1·35d. per 1000 feet at Beckton—where works had been constructed with all modern appliances, and where such an immense quantity was made—it did not follow it could be done at the same price in a place like Maidstone. Leaving out these items of £5500 and £7000, the special attention of the Committee was asked to the question of capital, and it could not be believed that the directors of a gas company were so lost to the ordinary principles on which commercial undertakings were carried on as to imperil their profits by wasting their capital; and by the action of the sliding scale Parliament had devised the best guarantee to prevent the possibility of a penny being expended unfairly and improperly. With respect to sulphur, the Company were willing to assent to the 20 grains, and the only contest on this point was whether or not that which applied to the Metropolis should apply to Maidstone. He (Mr. Michael) thought he had thus disposed of the whole of the opposition to the Bill, and with the greatest confidence he asked the Committee to grant the powers sought for, which would enure quite as much to the benefit of the Corporation and the consumers as it would to the benefit of the Gas Company.

The CHAIRMAN: Will you turn to the preamble, "Whereas it is expedient that the Company should be authorized to manufacture, purchase, or hire, and to use, let, and sell gas and other fittings, &c." You do not propose that the Company should become manufacturers of those fittings?

Mr. MICHAEL: No, they never do; but the clause is exactly in the form in which such clauses have been passed continuously by Parliament during the last three years. There is nothing against it in the petition.

Mr. KINGSFORD: We object to it.

Mr. MICHAEL said he had not directed attention to the matter because he assumed the Corporation were satisfied it was desirable. The object was not to manufacture, because no doubt the Company would be able to purchase cheaper than they could make.

The CHAIRMAN: Then why ask power to do it?

Mr. MICHAEL: Because, if we had not the power to do so, if we had to make a brass pipe or a connection, we might be restricted, and serious consequences in the working might ensue.

After some further conversation, the committee-room was cleared. On the Counsel and parties being called in,

The CHAIRMAN said the Committee had decided to pass the preamble of the Bill, with amendments. With reference to the extension of the limits, they were of opinion that such extension should not be granted. The recital in the preamble concerning the manufacture, sale, and hire of fittings, &c., was to be omitted. The Committee also thought that the new capital should be limited to £50,000, with borrowing powers of £12,500; that the standard price should be 3s. 8d.; and the illuminating power fixed at 15 candles, as offered by the Company. They had also decided, with reference to the sulphur test, to give 20 grains, with the three days average clause; the testing-place to be decided upon between the parties, and inserted in the Bill; and the Corporation to have power to test at any time without giving notice.

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TUESDAY, JUNE 22.

Mr. MICHAEL said that, with regard to the recital in the preamble, which the Committee had struck out on the previous day, giving power to the Company to manufacture, purchase, or hire, and let and sell gas and other fittings, and engines, stoves, and so on, the Corporation were willing that those words should be reinserted, and also the clause carrying out those powers, on the understanding that the word "manufacture" was omitted.

Mr. CLABON (Parliamentary Agent) having assented,

The CHAIRMAN said the Committee would reinstate both preamble and clause as amended.

The clauses were then proceeded with.

Clause 4, referring to the extension of limits, was struck out.

On clause 17, providing for the formation of an insurance-fund,

Mr. CLABON objected to the Company having both an insurance-fund and a reserve-fund, and asked that the clause should be omitted.

Mr. MICHAEL said it was Lord Redesdale's clause, framed after full consideration of the Gas-Works Clauses Acts of 1847 and 1871, its object being to enable gas companies to be their own insurers, in case of any accident, from fire or other causes, arising on the works. The clause had been inserted in every Act which had been passed since the sliding scale was adopted.

The CHAIRMAN said the Committee thought the clause should stand.

On clause 19, referring to the reserve-fund, which was also objected to,

Mr. MICHAEL said this was another of Lord Redesdale's model clauses, and had been expressly altered by Mr. Warner.

The clause was agreed to.

Clause 20 was altered by the insertion of £50,000 capital instead of £80,000, and the granting of £12,500 borrowing powers instead of £20,000.

Mr. CLABON said that supposing, instead of borrowing the £12,500 on mortgage, the Company raised it by shares or stock, it was quite clear that this must be done under the auction clauses, and if the clause provided for this he had nothing more to say; but if not he should like words to be inserted to this effect.

Mr. COOPER (Parliamentary Agent) said the clause was in the stereotyped form.

Mr. MICHAEL said that formerly there was a general power, under the Companies Clauses Act, to convert all borrowed money, or the larger portion of it, at the option of the company, into capital; but of late years Lord Redesdale had insisted that if this conversion took place it should be at a rate not exceeding 5 per cent.

The CHAIRMAN: Supposing, instead of raising £12,500 on mortgage, you raised it by shares or stock, would you be obliged to raise it under the auction clauses?

Mr. MICHAEL said his impression was that they would not, but he was going far beyond this. There had been a hard fight before a Committee of the House of Lords with respect to the British Gaslight Company—a Company supplying five places under peculiar circumstances, rendering it extremely difficult to issue the capital under the auction clauses—and the Committee passed the capital because it was limited to a dividend of 5 per cent., which was a benefit to the consumers. In London gas stock was sold by auction to pay 5·75 per cent., and therefore no hardship could accrue to the consumers by the clause being passed in its present form, whereas, if it were not so passed, all expenses incident to the sale would be so much loss, and would thus be a disadvantage to the consumers.

The CHAIRMAN said the Committee would insert the clause as it stood.

Clause 35 was amended by the omission of the word "manufacture" in relation to the sale, &c., of fittings and other things.

On clause 54, a saving clause, preserving the rights of the Corporation of Maidstone,

Mr. COOPER said in the Bill, as received from Mr. Warner, that clause had been struck out.

Mr. CLABON said he thought it should not be omitted. He did not think saving clauses were of any great value, but it was usual to have them inserted.

Mr. MICHAEL said he could endorse what Mr. Clabon had said as to the value of saving clauses, and the Company were willing for the clause in question to remain; but Lord Redesdale said he would not allow it.

The CHAIRMAN said he could not agree that saving clauses were not of value, and he thought the clause ought to stand the same as in the former Act.

The clause was agreed to, as were also the schedules to the Bill.

Clause 6*a*, restricting the amount of capital to be issued in any one year, was agreed to.

On clause 40*a*, referring to purity and illuminating power,

Mr. CLABON said the words which had been introduced specified that "from and after one year from the passing of the Act," the gas should not contain more than 20 grains of sulphur. He took it that it should read "from the passing of the Act."

Mr. MICHAEL said there would be all the proper apparatus to put up.

Mr. CLABON said the evidence most distinctly showed that it could be done at once.

Mr. MICHAEL said that might have been the evidence given on one side, and by the gentleman who did not know how gas was purified. By the use of the present purifiers and apparatus there was a quantity of sulphur left in the gas which was very strongly complained of by the Corporation, and to remedy this the Company would be obliged to erect additional apparatus. Was it reasonable to subject the Company to penalties during the whole time they were preparing the apparatus to carry out the decision of the Committee?

Mr. CLABON said that some of Mr. Adams's returns showed that the Company were at present purifying the gas so that there should only be 10 grains of sulphur.

Mr. MICHAEL said it must be considered that in summer there was

very little difficulty; but when the Committee were about to fix a maximum, it was a very different matter, because 2½ times as much gas would have to pass through the purifiers during the winter.

The CHAIRMAN suggested "from and after the 1st day of January next."

Mr. MICHAEL: Cannot you say February?

The CHAIRMAN said the Committee would agree to this. The three days average, however, would not apply to the illuminating power of the gas, as no application had been made to the Committee with reference to this subject.

Mr. COOPER suggested a separate sub-section, providing that the average of the testings taken on one day with regard to the illuminating power should be deemed to be the illuminating power for that day—which was the existing legislation for the Metropolis—otherwise one test only taken on one day might fix the Company with penalties for deficiency, whereas other tests taken during the same day might be above the necessary standard, and free them from liability to penalty.

The CHAIRMAN: One witness said the Company could change the illuminating power in a very short time.

Mr. MICHAEL: The usual clause with regard to tests is that they shall be made in the evening, when the light is really required.

Mr. CLABON said the last sub-section was to the effect that the Company should not be liable to penalties unless complaint were made to the justice within 15 days, which was a very short time; it ought to be 30 days.

Mr. MICHAEL suggested "two justices" instead of "the justice."

The CHAIRMAN said the Corporation only met periodically, and any report from the gas inspector would have to go before them. He thought it had better be 30 days, and two justices.

In reply to the Committee, Mr. COOPER said that if the tests were made in the morning, when but a small quantity of gas was being consumed, and that mostly for cooking and heating purposes, the illuminating power might be below the standard, while at the time when it was ordinarily consumed for lighting purposes, the gas might be as much above the required standard as it was previously below it. In such case the effect of taking the average of all the testings on that day would be to exempt the Company from penalties.

Mr. MICHAEL said it would be a simple thing to define the hours, and say between seven and ten o'clock.

The CHAIRMAN: We have considered that they might test at any time. (To Mr. Clabon:) What do you say to Mr. Cooper's suggestion?

Mr. CLABON said he would leave it in the hands of the Committee.

Mr. COOPER said it was in the metropolitan Acts passed since 1875 as the result of the recommendations of Mr. Forster's Committee.

The CHAIRMAN: How are you to get at the average in Maidstone, when there are no Referees?

Mr. MICHAEL said he did not see how the clause was to work, unless they had Referees to decide the number of tests, whereas between six or seven o'clock and eleven the Corporation might test as often as they pleased.

The CHAIRMAN: We do not think we can interpose the sub-section, but must leave the matter where it is. A member of the Committee reminds me that the Corporation thought they ought to have 16 candles instead of 15.

The clause, as amended, was added to the Bill.

On clause 40*b*, allowing an officer of the Company to be present during the testings, but not to interfere with them,

The CHAIRMAN said this clause entirely subverted the decision arrived at, and could not be inserted.

Mr. MICHAEL said the object of the clause was obvious. It was a criminal proceeding in order to enforce penalties, and if an officer of the Company were not present there might be a mis-reading or an incorrect testing, and no evidence could be offered on the part of the Company, and therefore they would be at the mercy of the examiner for the time being. He had never known a case where an officer of a company had not been admitted.

Mr. COOPER said the clause was in exact conformity with the metropolitan Acts.

The CHAIRMAN said that was an agreement between the parties, which had received the sanction of Parliament; and if the proposed clause had been agreed to it would have been another matter.

Mr. CLABON said that if notice was to be given every time, the Company would have an opportunity of restoring the illuminating power to the proper standard, and the value of the decision of the Committee would be destroyed.

Mr. MICHAEL said that unless the clause was inserted the Company could not watch the testing.

Mr. CLABON said they would be able at any time to bring the evidence of the testing at their own works to show that the testing at the appointed place was an improper one.

Mr. MICHAEL said the Company would have to take continuous testings from morning till night, because they would not know when the Corporation were testing.

Mr. *West*, in reply to the Chairman, said the gas was tested for sulphur, and also for illuminating power, twice a day, and records kept of the results; but no set times were appointed.

The CHAIRMAN suggested the words, "and it shall not be necessary for the Gas Examiner to give any notice of such testing to the Company."

Mr. MICHAEL said he had no objection to this.

The clause, as amended, was agreed to.

On clause 41*a*, referring to the testing-place,

Mr. CLABON said there seemed to be some doubt whether it should be fixed at the market-place. He therefore proposed to add the words, "or some other place to be agreed on between the Corporation and the Company."

Mr. COOPER said he had no objection to the proposed insertion, but asked that the Corporation should provide a separate testing-place for the Company in the same building.

The CHAIRMAN said this was but reasonable, providing the Company bore their own expenses.

Mr. MICHAEL said he agreed to this.

The clause, as amended, was then agreed to, and the Chairman was directed to report the Bill, with the amendments, to the House.

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PROPOSED PURCHASE OF THE NEWCASTLE-UNDER-LYME GAS-WORKS BY THE TOWN COUNCIL.—On Thursday, the 15th inst., an extraordinary general meeting of the Newcastle-under-Lyme Gas Company was held to consider the notice given by the Corporation of their intention to purchase the gas-works under the powers contained in the Newcastle-under-Lyme Corporation Act, 1877, and to take powers from the Shareholders to negotiate with the Corporation, and to complete the sale. Mr. Hargreaves, the Chairman of the Company, presided. After consideration of the question, it was decided to offer the undertaking to the Corporation at a certain price, in order to avoid if possible an arbitration, in accordance with the above-named Act, under the provisions of the Railway Companies Arbitration Act, 1859.

# Miscellaneous News.

## SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

### INAUGURATION OF NEW WORKS AT CANNOCK.

The formal opening of the new works recently completed by the South Staffordshire Water-Works Company in the neighbourhood of Cannock took place last Wednesday, when, at the invitation of the Directors of the Company, close upon a hundred gentlemen, the great proportion of whom were connected with the Local Authorities of the districts embraced in the Company's limits of supply, assembled to mark the virtual completion of the scheme begun by the Company at Lichfield some twenty years ago. In a subsequent issue we may lay before our readers some account of the rise and progress of the undertaking, beyond that given by the CHAIRMAN (Mr. Frank James, J.P.) at the luncheon referred to farther on; now, however, we are concerned principally with last week's proceedings.

A special train for the convenience of the visitors left Birmingham, where the offices of the Company are situated, for Cannock, which was reached about half-past ten. Here six well-appointed four-horse drags were in waiting to take the party to the Huntington pumping-station—a drive of something like a mile and three-quarters. The machinery here, as well as that at Hednesford, was much admired, and elicited many marks of approval from those who had the opportunity of inspecting it. The drive from one pumping-station to the other was over the Cannock Chase, and it proved a very pleasant part of the day's outing. The company then proceeded to the Scout House reservoir, on the high ground just outside Hednesford; and here, after a survey of the work that has been completed, luncheon was served in a marquee erected on the Company's ground.

The whole of the water required for the service of the Company's extensive district—which includes Burton-on-Trent, Stretton, Cannock, Hednesford, Whittington Heath, Chasetown, Brownhills, Pelsall, Walsall, Rushall, Wednesbury, Darlaston, Upper Sedgley, Coseley, Tipton, Upper and Lower Gornal, Dudley, Brierley Hill, Brockmoor, Pensnett, Rowley Regis, Halesowen, West Bromwich, Oldbury, and Smethwick—is pumped from wells sunk in the deep water-bearing strata on the east and west, and is derived from two distinct sources of supply. The original source is near Lichfield, where, in addition to a well at Sandfield, there is a heading, or tunnel, about 3½ miles in length, which has been driven through the red sandstone rock, for the purpose of collecting water from the springs that abound there, and for conveying to the well the water from the newly-constructed Bourne Brook reservoir. The second source of supply is the conglomerate, or pebble-bed formation, a subdivision of the new red sandstone rocks, situated near Hednesford and Huntington, and on the Penkridge side of the Huntington belt. The quantity of water obtainable here is very large, and much in excess of the Company's present requirements. It is served from the two wells already referred to, about 3½ miles apart, whence it is pumped into the Scout House reservoir.

The distribution of the water is effected by the use of large pumping-engines, which force it through the mains into the district, where the local service reservoirs and engines maintain a constant equable pressure at the many varying levels. From Lichfield, the water pumped at Sandfield is conveyed by a main in a north-easterly direction to Burton-on-Trent, whilst a southern main carries another portion along the South Staffordshire Railway to Walsall, Wood Green, and Wednesbury. Here the system is joined by the trunk main from the Scout House reservoir, which, passing in a southerly direction through Bloxwich and Walsall, strikes Wood Green, on its way to the high land of Rowley, farther south. All these places are dominated by the Scout House reservoir. For reaching some of the high-lying districts about Dudley, there is a pumping-station at Wood Green, where the water is re-pumped, and this is so contrived as to secure the full force of the pressure from the Scout House reservoir, without suffering the water to "see light." For casual needs, there are two auxiliary pumping-engines at Coneygre (Tipton), which may be used in emergency to re-pump the water to some of the varying levels of the district. Generally, it may be observed that the whole apparatus of engines for pumping and re-pumping, of reservoirs for storing, and of mains for distributing the water, are sufficient for a much larger demand than the Company have yet experienced.

For pumping the water from the primary sources of supply, there are eight engines, representing in the aggregate 1125 nominal horse power, and capable of pumping 14½ million gallons in 24 hours. For re-pumping to the higher levels there are five engines of 520 nominal horse power in the aggregate, and capable of re-pumping about 12½ million gallons in 24 hours. Eight of the thirteen engines are Cornish non-rotary engines, with special adaptations of pumps, &c., and they are models of mechanical excellence in economy and steadiness of work, combined with the greatest durability. The aggregate storeage capacity of the reservoirs is 178 million gallons. Of these the principal are Stowe Pool (Lichfield), with a capacity of 50 million gallons; the Moat reservoir (Walsall), which covers 6 acres on a site 220 feet above Stowe Pool, and is calculated to contain 33 million gallons; and the Scout House reservoir, at Hednesford. There are 81 miles of pumping or trunk mains, and 189 miles of distribution or branch mains. The trunk mains are calculated to deliver 11¾ million gallons of water per day of 24 hours. The number of houses at present supplied by the Company is 35,831, representing a population of 179,155, in addition to which there are 1906 trading establishments supplied. During the past half year the daily consumption of water has been about 5,154,000 gallons, which gives an average of 28 gallons per day per head of the population paying for water; but correcting this calculation for domestic supply only, the average per head per day is about 22 gallons. This average is exceptionally high, in consequence of burst mains, frost, &c. The average of the past seven years has been 16 gallons per head per day for domestic use.

The older portion of the works was planned by the former Engineers of the Company, Messrs. M'Lean and Stileman, and carried out under their direction and that of Mr. Marten. The new works in the Cannock district, and the mains connecting them with the rest of the Company's system, as well as the pumping-station at Wood Green, the reservoir at Rowley, &c., were planned and carried out under the superintendence of the Company's present Engineer, Mr. W. Vawdrey.

The cost of the various works and extensions has necessarily been heavy, and (as regards the original or older portion) more so than it would have been if the Directors had not been hampered by the financial troubles caused at the outset by the difficulty experienced in placing the shares. Engineering difficulties, arising from the many abrupt variations of level in the South Staffordshire district—which, seen in section, resemble nothing so much as the waves of the sea in rough weather—and the necessity for finding additional sources of water, contributed to swell the cost of the mains and pumping machinery and reservoirs, and to increase the capital outlay much beyond the original estimate. Thus, instead of £160,000, as fixed by the first prospectus of the Company, the capital account, including mortgage bonds and preference stock, now amounts to

considerably more than £700,000, of which the expenditure on works is distributed as follows:—

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| Cost of the original works, a little over . . . . . | £406,000 |
| Outlay on new works, including extensions at Dudley, Wood Green, and Rowley, about . . . . . | 313,000 |
| Total expenditure on works, about . . . . . | £719,000 |

This rapid growth in the capital outlay of the undertaking has combined with the heavy maintenance charges incidental to a mining district, trade depression in the Black Country, and the backwardness of some of the Local Authorities in availing themselves of the Company's service, to disappoint the expectations of the promoters as to the immediate effective returns of the undertaking. It may be stated here that the Company's profits are limited to 10 per cent. per annum on the original ordinary stock, and 7 per cent. on the new ordinary stock.

At the conclusion of the luncheon last Wednesday various toasts were proposed, among others, "Success to the South Staffordshire Water-Works Company;" in replying to which the CHAIRMAN said that although this occasion might be looked upon as the public inauguration of the works of the Company in the district, yet these works had been in existence and in operation for the last twelve months. It was intended, before any water was supplied through the Scout House reservoir, that some such meeting as the present should be held; but, somehow or another, the Fates were against the entertaining of such a proposal last year, and the Company were obliged to defer the contemplated meeting till this year. Referring to a pamphlet which had been placed in the visitors hands, he said that he thought it would show, at any rate, that the Directors of the Company had not been influenced entirely by the desire to further their own interests, but that they had looked principally and primarily to the interests of the public. In 1853 this "bantling," which had grown into the "giant of to-day," started with the small nominal capital of £160,000, and great was the difficulty of raising even that sum. He was now at liberty to say that the sum was raised solely by pledging the shares of the Company with what were then known as Lloyd's Bonds, and it was only after a long series of years that the Company were able so far to complete their work as to supply the limited district of Walsall and its immediate surroundings. Well, time went on, and they were under the necessity of appealing occasionally to Parliament; for whatever individuals might be able to do, public companies could only act in accordance with the powers conferred upon them by Parliament; and if, unfortunately, they failed to raise money to enable them to construct their works within the time Parliament gave them, their powers lapsed, and they had to go back to school and learn their lessons over again. It had been the fortune, or rather the misfortune of the Company to make several appeals to Parliament; he believed they were something like five in number. However, they went on and on, teaching the people to consume the water, until they came to the water drought, commencing in 1874. The Company might be said to have then expended a capital of £300,000, and to have done, as a great many of the Shareholders thought, the work with which they were entrusted. He could honestly say now that it was not until 1874 that the Directors of the Company became painfully alive to the obligations which they had incurred, as well as the privileges conferred upon them. They had gone to Parliament from time to time, like many other companies, and asked for extension of territory, little thinking that the districts thus included would turn upon them and say, "You have privileges conferred upon you, and now you must comply with your obligations." In 1874 they had imposed upon them the necessity of looking for an increased water supply, because they felt and believed that the supply which they had, had not realized the expectations of the promoters of the Company. Yet even as late as 1867, so great was the faith of the promoters of the Company in the inexhaustible supply of the district which they then possessed, that, finding their great neighbour—Birmingham—with plenty of money and little water, they thought it would be a grand thing to make an exchange with them, supplying them with water, and receiving some of their money in return. In justice, however, to Mr. M'Lean, the originator of the Company, it should be stated that he founded his opinion as to the quantity of the water that would be available upon the execution of some important works in the neighbourhood of Lichfield, which, for want of funds, had never been completed. In 1873 the Company were actually and really up to the hilt of their supply, and did not know how soon disaster might befall them. At that time the Company had risen in pecuniary position, and from a dividend of 2½ per cent. gradually attained a dividend of 6 per cent. Then, in 1874, they felt the necessity of increased supplies, and after consulting Professor Ramsay, went to Parliament in 1875 for the purpose of obtaining additional powers. These powers were granted, a magnificent supply of water was secured, and the gentlemen present had been invited to see with their own eyes what no doubt they had often heard about with their ears. The Company had cast its bread upon the water, and had no doubt it would return to them after many days. The works which had been formally inaugurated were supplied by the Company in order to contract themselves out of their parliamentary obligations. He acknowledged the loyalty and confidence reposed in the directorate by the Shareholders, and said he believed they would now see that their faith was not misplaced. He did not hesitate to say boldly that from a Director's point of view, and from a Shareholder's point of view, the time had not yet come for the public to take hold of the Company. He thought he was betraying no secrets when he said that he hoped they had touched the bottom with their dividend of 3 per cent., and that though they might not go by leaps and bounds, there would be a steady rise until they realized what they had a right to expect—a fair return for the money they had expended. He hoped he might be permitted, before he concluded, to propose the toast of "Our Guests," including the Local Authorities of the districts which the Company supplied with water. In the first instance he might say that Local Authorities, as a rule, never did originate the supply of water to their districts, but somehow or another took up and adopted the results of the energy and perseverance of those who had led the way. He asked the Authorities to look upon the Company as fellow-workers for the common good. The Postmaster-General, in a speech on the London water question, said a water supply should be pure, constant, and cheap. What the great Metropolis was looking for in 1879 had been found in South Staffordshire years ago, and it was a fact that there was no district in England at the present moment with a supply of water at so cheap a rate as the vast bulk and majority of the people of the district the Company supplied. The Authorities should now say to the people: "You shall no longer breed disease in the community, but you shall be compelled to take that which is put within your reach."

The toast having been acknowledged on the part of the visitors, the proceedings terminated, and a drive to Hednesford station, to catch the special train timed to leave there at five o'clock, terminated a pleasant excursion, the arrangements for which, it is right to say, were most satisfactorily carried out by the Company's Secretary, Mr. H. Haselden.

## THE HARTLEPOOL GAS AND WATER COMPANY.

From an article published in the *South Durham Herald* of the 17th inst., we extract the following interesting particulars in reference to the above-named Company:—

The old gas-works at Hartlepool were originally erected by Mr. J. A. West, who constructed similar works at Darlington, Richmond, and other places, entirely on a private adventure footing. In the course of time a Company was formed for the purpose of taking over these works. The usual Bill was introduced into Parliament, and received the Royal Assent on June 26, 1846. The capital was fixed at £18,000, and the works were purchased from Mr. West for £5250. The capital is now half a million sterling. In the early days of the Gas and Water Company's history, the price of gas was no less than 10s. per 1000 cubic feet; in the present year it has fallen to 3s. 4d. The contrast points its own moral. The moving spirits in promoting the Company were Mr. E. Turnbull, the present Chairman of the West Hartlepool Improvement Commission, with whom was associated Mr. J. Lawrenson. Amongst the first Directors of the Company were the late Mr. E. Waddingham and Mr. J. Grey, the latter of whom still survives, and after acting as Deputy-Chairman for many years, has been succeeded in that office by Mr. W. H. Fisher. Mr. T. Holmes, of Hartside, has been Chairman for 14 or 15 years.

No enterprise, whether of a public or a private character, can succeed unless a considerable degree of enthusiasm which does not necessarily look for pecuniary recompense is thrown into it. The promoters of the Company possessed this essential vigour, and the consequence is that they now reap the fruit of their labours. Such has been the increase in the revenue, that whereas in June, 1850, it was put down at £1400, in June, 1878, it amounted to £30,000. It is too much the custom to look upon the exertions of men engaged in a private adventure as merely of a selfish character. As, however, the motive of self-advancement lies at the root of all human endeavour, there should be no attempt to disparage or undervalue the shrewdness and business capabilities which men display. The directorate of the Hartlepool Gas and Water Company has generally been composed of men gifted with the power to look ahead, and provide for the requirements of the future. The consequence is that there has never been any unseemly lack of provision, and as the district has developed the Company have been able to provide for their wants without having to put on any hurried or violent effort. We are so accustomed to take the provision of gas and water, and other requisites of life, as a matter of course, that we do not pause to consider how dreadful would be the position if, through parsimony or any other cause, the Company had failed to arrange the needful supplies. The rapid growth of the iron trade, which sent its offshoots within the district of the Gas and Water Company, demanded a large supply of water. The Company consequently developed this portion of their trade by the extension of their reservoirs and pumping power. Two large condensing beam-engines of 25 and 45 horse power are used for delivering the water into the supply-tanks, and are capable of conveying over 80,000 gallons per hour. Although the demand for water has considerably decreased since the depression in the iron trade commenced, the Company have wisely maintained their works, so as to be ready for the revival whenever it may take place. In addition to the original water-works, there are reservoirs at Hurworth Burn and Hart, whence soft water is conveyed in mains distinct from those in which the water travels from the old works. From the gas department, however, the main monetary strength of the Company is derived.

The Shareholders of this Company have never yet had the doleful intimation which is so frequently conveyed to shareholders of limited companies—that no dividend would be declared. The dividend has fluctuated according to the comparative prosperity of the times, but it has rarely, if ever, fallen below 6 per cent.

It has been the good fortune of the Company always to be served well. The present Secretary, Mr. T. Trewhitt, has been in the service of the Company 28 years, for more than 22 of which he has acted as Secretary. Mr. T. Mossman, the Engineer, has held that position for ten or eleven years, and has been in the service of the Company altogether about 16 years. The fact that the Company have retained their officers for so long is a conclusive proof of the ability and integrity of the officers and the shrewdness of the Directors.

The Company are now completing a large gasholder capable of containing about 900,000 cubic feet of gas, which will bring up the total storeage capacity to 1¼ million cubic feet. The plans have been drawn, and the work carried out under the supervision of Mr. Mossman. It is quite a treat to visit the Company's gas-works. The buildings are all of a plain, substantial character, utility rather than ornament being one of the leading features of the place. The exhauster-house is perhaps an exception to the rule. It is almost prettily constructed, and the visitor cannot fail to be struck with the manifest attention which is paid to the elaborate and beautiful machinery contained within it. The new gasholder is in two lifts, each 30 feet deep, the outer lift being 140 feet, and the inner 137 ft. 6 in. in diameter. The entire works bear evidence of a careful personal supervision, and the continued prosperity of the Company is not to be wondered at, when its affairs are directed by men of great business capacity in a liberal but businesslike spirit, and their directions are carried into effect by an able Secretary and a skilful Engineer.

## DEVONPORT GAS COMPANY.

The Annual General Meeting of this Company was held on Tuesday last—Mr. R. C. SMITH in the chair.

The SECRETARY (Mr. J. Willing) having read the notice convening the meeting, the following report of the Directors was taken as read:—

The accounts for the past year will be found generally satisfactory. There has been a considerable increase in the charges for renewals, and also in the item of rates and taxes, consequent on the new assessment of the works. Happily this has been accompanied by an increase in the sales of gas and in the amount realized for residuals.

There have been some new works, and also new mains have been laid in various parts of the borough, and others have been taken up and replaced with new ones of larger calibre. The effect of these renewals is beginning to be felt in the reduction of the waste, or unaccounted-for gas, a saving to the extent of 3 per cent. having been made on the prece ding year.

After providing for all outstanding liabilities, and the payment of the interim half-yearly dividend in February last, there remains a disposable balance of £3078 8s. 10d., from which it is proposed to declare a dividend of 5 per cent. on the original, and 3 per cent. on the guaranteed shares, free of income-tax, carrying forward the balance of £967 12s. 3d. to next account. Debentures to the amount of £500 have been paid off, and others issued for £250.

The CHAIRMAN, in moving the adoption of the report, said, comparing the accounts with those of last year, they presented many favourable features. Several items showed considerable improvement. The fact was the present was a very favourable time for gas companies. The prices of coal had ruled very low, and the freights also had been lower than for 20 years past. The Company's plant and machinery had to a considerable extent been overhauled, and this had resulted in a saving of 3 per cent. of gas. Out of 113 million cubic feet manufactured, there had been sold 100 millions, being 11½ per cent. waste as compared with 14½ per cent. in the previous year. Great credit was due to the Manager for the favourable state of the accounts, and he (the Chairman) believed the amount of waste

might be reduced still further. The Company had gone on improving in this respect for several years. Considerable alarm had been caused, wherever large numbers of labourers were employed, by the Employers Liability Bill, which had been recently introduced into Parliament. He thought the principle of the Bill was a right one, and only fair and just, and the Directors of the Company had acted on that principle. They had at the works a club which each man was expected to join; and in case he should be disabled by accident or sickness, the workman received 7s. per week from the club, and the Directors then supplemented it with a like amount. By this means every man would, in the event of accident happening to him, receive from 50 to 75 per cent. of his wages. If some clause having this object could be introduced into the Bill, he thought it would do away with a great many of the objections raised to it.

Mr. W. Colwill seconded the motion.

Mr. W. P. Harvey said he did not see in the accounts any reference to the manufacture of sulphate of ammonia, and he thought the salaries, rates, and taxes ought not to be included in one item. He also wished to know how the Company's reserve-fund was invested.

The Chairman said the salaries last year were £910; in the previous year, £855 18s.; and they had been paid to the officers of the Company. The Directors received an honorarium of £200 a year for their services. The quantity of ammonia produced last year was 100 tons, and it realized £1700 gross. The reserve-fund was invested in colonial bonds, and was earning a little over 5 per cent. Interest was added to the principal.

The motion was carried, and the dividends recommended in the report were declared.

The retiring Directors, Mr. R. Oram and Mr. T. S. Honey, were re-elected, and Mr. Mogg was re-appointed Auditor.

A vote of thanks to the Chairman, Directors, and Officers of the Company was then passed, and the Chairman having briefly replied, the proceedings terminated.

## THE NATIONAL EXHIBITION OF BELGIUM.

(FROM OUR OWN CORRESPONDENT.)

[We intend, in a series of letters from a Brussels gentleman, to lay before our readers an account of the principal objects of special interest to them in the "National Exhibition of Belgium," now being held. We publish to-day the first of his communications.—Ed. J. G. L.]

When the visitor to the exhibition has gone through the section of Arts and Manufactures—which is, by the way, the most interesting one in the whole exhibition—he should certainly not fail to take a glance at the *fac simile*, on a very small scale, of the Brussels Gas-Works. It is possible that the model itself will not present any striking feature; but if the visitor happens to be connected with the gas industry, it will suggest to him the idea of paying a visit to the gas-works themselves. My advice would certainly be for him to do so; and if he took my advice, I should be somewhat surprised if he did not afterwards thank me for it. I, therefore, send you a few particulars respecting these works, which I think will be interesting to your readers.

The city of Brussels has been lighted with gas since the year 1819 (Aug. 24). The number of street-lamps first used for the public lighting was 700, which had increased to 1200 in 1839; while at the present time there are 4400 public lamps in use. The first concession was granted to a private company; but in 1844 it passed into the hands of the Imperial Continental Gas Association. When the concession was to be renewed, in 1873, the Municipality determined on having the works removed from the city; and subsequently resolved upon taking the gas supply into their own hands. An extensive site, comprising nearly 25 acres of land, was purchased at Laeken, a suburb of Brussels, and upon this it was arranged to erect gas-works. It was not until December, 1874, that the new works were commenced, and they were carried out according to the plans and under the superintendence of M. Somzé, the Engineer to the Municipality. By the month of August in the following year the works were sufficiently complete to commence making gas, though they were not by any means finished. The cost of the new works, including the amount expended on the purchase of the old establishment, and the outlay incurred in thoroughly overhauling and renewing the service-pipes, was about £490,000. The price of gas is now 20 centimes per cubic mètre, which is equal to 4s. 8d. per 1000 cubic feet. At the beginning of the present year there were in use 10,997 meters, and the total number of consumers supplied was 163,000.

The new works are situated near the Schaerbeek Terminus and the Willebroeck Canal, and with these they are connected by lines of railway. The annual consumption of coal amounts to 60 millions of kilogrammes; and about 40 million kilogrammes of coke and other residuals are sold. The most important portions of the works have been constructed in such a manner as to be capable of producing 30 million cubic mètres of gas per annum. This year the production may be estimated at 17 million cubic mètres.

The principal buildings are the retort-houses and coal stores; the purifier-houses, with the annexes; the gasholders, workshops, and offices.

The retort-houses, four in number, are parallel with each other. Each house contains four groups of eight beds of retorts; and each bed heats 7 retorts; consequently there is a total of 896 retorts. The distillation of the coal lasts for a period of four hours, and a bed of retorts produces about 1400 cubic mètres of gas daily. The mouthpieces of the retorts are closed by a new kind of lid, with tightly fitting joints, which do not require any cement. The heating of the retorts is done by coke only; the air that is consumed in the fire-grate being previously heated in galleries disposed under the beds. The arched roof of the furnace and the retort chambers is constructed of hollow fire-bricks forming an air space to prevent the dissipation of heat. The ascension-pipes are connected to the horizontal receiving-main by rectangular bends, so that all the pipes are easily accessible. The hydraulic main is of much the same form as a quarter of a circle; the upper side being flat. It is separated in the length by a sheet-iron rivetted to the upper side. Between the end of the sheet-iron and the bottom of the hydraulic main a space of 2 inches is left, so that the tar, &c., collecting at the lower part of the main is easily drawn off without interfering with the working.

From each hydraulic main the gas passes through a series of conducting-pipes, 15¾ inches in diameter and 492 feet in length, for each group of 16 beds of retorts, and from thence through cascade scrubbers, of which there are sixteen, having a height of 36 feet and a diameter of 8·2 feet. They are worked in pairs. In this apparatus the cleaning of the gas begins, and it is finished in a large scrubber, a collecting one, 19·7 feet in diameter, and 78·8 feet high. The gas arrives at the centre of the base of each scrubber, and passes over and under flat discs held between pairs of hollow opposed discs kept cool by surrounding water. After traversing these it passes through four layers of coke kept continually damp by sprays of water descending from a cistern at the top of the scrubber. The water that has passed into the large scrubber is driven up by means of a gas-engine into the cisterns of small scrubbers, and by this double circulation the water is charged more and more highly with ammoniacal products, which are driven off with the gas, and at last it comes to the degree of saturation required for its treatment. The scrubber cylinders, which are of sheet iron rivetted together, are provided with doors for the renewal of the coke; and at the top the water cisterns are surrounded by an ornamental wood cover. The passage of the gas through the large scrubber is regulated by the purity of the gas after its exit from the other scrubbers, the deposition of the naphthaline being facilitated by a jet of steam. The total surface of condensation, including the condensing-pipes on the retort-house walls, is nearly 15 square feet per 1000 cubic feet of gas made in 24 hours.

The coal stores are five in number, and they are placed alternately with the retort-houses. Each will contain 1600 tons of coal. Railways, crossing them in their lengths, allow of the coal being stacked under the most economical conditions. The coals used are from the Borinage, Ruhr, and Newcastle basins. At times Scotch coals are employed, when it is desired to increase the illuminating power of the gas. Belgian coals are sent in railway trucks; foreign coals by boats.

From the scrubbers the gas is drawn by two of Schmitz's exhausters, with automatic regulator, supplemented by a Körting one. They are arranged so that the gas may be delivered either into the gasholders or into the city mains, and they are of such a power that only one engine is sufficient during the summer season. The speed of the engines is regulated by indicators with electric signals. The motive power for the exhausters is supplied by three Galloway boilers of 20-horse power.

The purifying materials employed are lime and oxide of iron. There are 26 purifiers, 6 mètres long and 3 mètres wide. Each is provided with a bye-pass valve, and other valves divide the purifiers into series and batteries. Usually the gas passes through three oxide purifiers, and afterwards through a lime one. The purifiers are disposed in two parallel rows in a special building provided with a steam travelling crane. They have the ordinary external case and water-jointed cover, but, in addition, they have an internal frame which supports the trays. When it is desired to change a purifier, these frames are lifted out with their trays, and the whole is transported by the travelling crane to a place where the revivification takes place by means of a forced current of air. This arrangement reduces the purifying labour to a minimum. A De Nayer boiler of 70-horse power supplies the motive power.

On its way to the holders the gas passes through three station-meters, each having a measuring capacity of 1,765,000 cubic feet per day, at the rate of 100 revolutions per hour, and from these it passes into four holders, three of which have a capacity of 390,000 cubic feet each, and the other of 780,000 cubic feet. A fifth one, of a capacity of 780,000 cubic feet, is about to be erected. The tanks are entirely above ground. The three smaller are of sheet iron, rivetted together with T-iron hoops throughout their whole height. They are 33 ft. 6 in. high, and 117 feet in diameter. The larger one, as well as the holder which is not yet erected is 33 ft. 6 in. high and 164 feet in diameter. Its construction is a special one. The lower 17 feet are composed of a series of superposed channel irons, rivetted together with the flanges outwards, and every alternate ring of the lowest six rings is strengthened by T-iron hoops. The joint between two channel irons is secured with iron cement. The upper part of the tank is of sheet iron. The holders are single-lift, and are constructed without any trussing for the roof, which, when the holder is landed, is supported on wooden framework. The holders are externally stayed with vertical channel irons, and internally have angle-iron gusset stays at the top. At the top and bottom of the larger one there are box girders, which act as stiffeners, and also, being filled more or less with water, are employed to adjust the pressure. Gas thermo-syphons are employed to maintain a suitable temperature of the water during winter. The peculiar feature of these holders is that the gas enters and leaves at the top, instead of, as is usual, at the bottom of the tank by underground pipes. At the two opposite ends of the diameter are fixed two double tubes, one inside the other, the space between being filled with water, to make a hydraulic joint for a pipe which slides therein, and which, being fixed to the top of the holder, rises and falls with it. The gas enters the bottom of the internal tube after passing through a stop-valve, rises therein, and enters the holder through an elbow fixed and strongly stayed thereto. At the top of the moving pipe is a disc-valve, so that by this and the valve previously mentioned the gas may be wholly shut off from the telescopic arrangement, either at the exit or entrance side, both being alike. Many advantages are claimed for this system, more particularly with reference to facility for repairs and cleaning, and non-liability of the supply-pipes to be broken by contraction or settling of the tank foundations. The arrangement has also the advantage of placing within view all the pipe connections for the entrance and exit of the gas.

The coke which is produced is chiefly sent to Flanders. That sold for private requirements in the city is subject to special treatment, which consists in breaking and separating it according to its size. Two coke breakers worked by a gas-engine of 6-horse power will deliver 11,000 bushels of coke every day. The breeze produced by this operation is used for making agglomerated tar blocks, manufactured in the works, and used for heating the retorts. A compressed fuel machine in one of the coal stores will turn out 20 tons of this fuel per day. The ammoniacal liquor is either formed into ammoniacal sulphate, or concentrated in Solvay's distilling apparatus.

I must say that the lighting of the city of Brussels is not quite so easy as in other towns; indeed, it is a very uneven place. The difference of level between the lowest part and the highest is 74 mètres, or 297 feet; hence the necessity for having two mains, one for the lower and the other for the higher district. Beyond this six Giroud's regulators are fixed at a point half way between the two levels, in order to have the lighting of these parts of the city perfectly well regulated and uniform. The gas therefore passes into the town by two mains, one of 23·6 inches in diameter for the higher parts, and the other of 33·5 inches for the lower parts. The joints, which are made on M. Somzé's principle, are of conical form, rendered gas-tight by a ring of india-rubber placed in a groove in the socket portion of the joint. The entire length of mains in the city is 159,720 yards, and the diameter varies from 3 to 33·5 inches.

The entrance gate of the works is in very fine style, and I think I need not add anything to the foregoing description to show that the city of Brussels has not spared any expense in order to have, if not the largest, at least the most attractive-looking gas-works in the world.

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The Purchase of the Wellington Water-Works by the Improvement Commissioners.—At the meeting of the Wellington Improvement Commissioners last Wednesday, a letter was read from the Local Government Board sanctioning a loan for the purchase of the water-works by the Commissioners, the loan being granted under the provisions of the Public Health Act, repayable in 40 years. The Chairman (Mr. Knowles) proposed to rescind a resolution of the Commissioners passed last November, which provided that the purchase of the water-works should be by arbitration, so as to enable it to be made by private treaty. A discussion lasting over an hour took place, when 4 members voting for the resolution and 4 against it, the Chairman gave his casting vote in favour, and declared the motion carried. The Clerk, however, ruled that it was necessary for two-thirds of the members of the Board to be present and vote on the question before any action could be legally taken. The motion therefore was withdrawn.

## SOME NOTES FROM AMERICA.

(FROM OUR OWN CORRESPONDENT.)

Gas affairs in New York remain in about the same condition as at the date of my last letter; while in the sister city—Brooklyn—the second opportunity has been allowed to pass unimproved, whereby the gas supply of that city could be put on a more satisfactory basis. Ever since the latter part of last year, when the attempt to consolidate the several Companies proved futile, negotiations have been in progress, which it was hoped would end in combining at least five of the seven Companies supplying the city. Unfortunately this second attempt at amalgamation has met the same fate as its predecessor, and, as a consequence, it seems that the present state of affairs is to remain unchanged.

In Baltimore greater wisdom has prevailed. The three Companies of that city have combined, and from June 30 they lose their individuality, and exist under the common name of the "Consolidated Gaslight Company of Baltimore City." The capital stock will be 6,000,000 dols. (£1,200,000), divided into three equal parts, or 2,000,000 dols. to each Company. Bonds of the Consolidated Company for 3,600,000 dols. (£720,000) are to be issued, of which 1,600,000 dols. (£320,000) are to be divided among the Stockholders of the Baltimore Company, to reimburse them for the capital investments they have made out of revenue account; to the People's Company 200,000 dols. (£40,000) for a like reason; the remainder of the bonds to be applied to taking up the outstanding bonds of the three Companies. Time will prove the wisdom of combining; but the consumers can hardly look for any great benefit when the Company, with their large capital and bonded indebtedness, will have to make a profit of 1 dol. 36 cents (5s. 5½d.) per 1000 feet of gas sold simply to pay 10 per cent. interest on their capital, and 6 per cent. on the bonds. I neglected to state that the bonds are to run for 30 years.

Edison has not yet made public any new invention which will place gas companies among the things of the past. Whether he has really given up his scheme of revolutionizing the lighting of the world, or is pursuing his labours with great quietness—which would be something very unusual for him—time only will show. Certain it is that the holders of stock in his company cling to it very tenaciously. I still hold to my opinion, that though he may again bring out some novelty in electric lighting—ingenious but impracticable—which will send the price of the stock up to a fabulous figure, yet he will fail to change things to such an extent as to force gas companies either to suspend, or make gas only "for other than illuminating purposes."

A few of the leading papers here have been advocating the use of Ericssen's caloric engines, for driving the electric light generators for private houses. These little engines, working by the alternate expansion and contraction of a given quantity of air, were designed for pumping water and such light work in private dwellings. The heating of the air may be done by a small coal furnace, or better, gas may be used. An engine with an 8-inch cylinder, using 15 feet of gas per hour, will raise in the same space of time 350 gallons of water to a height of 50 feet. The *New York Times*, in an editorial, says: "The great bar to the introduction of the electric lamp for house illumination in such a manner as to prove or disprove its practicability has hitherto lain in the lack of a convenient, easily-managed, and reliable motor, at a small cost, capable of operating a generator of electricity sufficiently powerful for domestic purposes. There is no sort of doubt of the adaptation of the Ericssen motor to supply this deficiency. . . . The experience of Professor Draper, who lights his Madison Avenue mansion by electricity, furnished by a generator operated by means of a gas-engine, has been that the illuminating capacity of 1000 cubic feet of gas can be nearly doubled by employing it to generate the electricity. . . . Such being the case, any wealthy citizen of New York City, who cares to test the practical working of the electric lamp, has it in his power to decide upon the availability of electricity for domestic purposes by that best of all methods—the method of experiment under the precise conditions which it must meet successfully, or fail as an illuminator. . . . But will Edison, Sawyer, and Brush care to submit their pretensions to such a practical test of availability as that just suggested?" Very likely they will not. Electricity has to supersede gas in street lighting before it can supplant it for illuminating dwellings; and, if this small motor were the only thing which has hitherto been wanting, gaslit houses would long before this have been a thing of the past; for what better motive power could be desired than a small gas-engine?

At the recent meeting of the Western Gas Association—the full minutes of which are to be found in their official paper, the *American Gaslight Journal*—the subject of gas engines and stoves received considerable attention. Mr. Ramsdall, of Vincennes (Ind.), spoke of a 17-horse power "Otto" silent engine, which he had imported from Germany, and placed in a grain elevator in his city, supplying the motive power for two elevator belts 60 feet high, one 10-inch conveyor 135 feet in length, a wheat-cleaner, fan, and pump, with a consumption of only 11·7 cubic feet of gas per nominal horse power per hour. The price of gas being 2 dols. (8s.) per 1000 feet makes the expense of this engine 40 cents (1s. 7½d.) per hour. It is evident that this engine is not worked to its full power, so, for the sake of comparing it with a steam-engine, I will take it as doing 13-horse power work.

*Expense of Running a Steam-Engine of 13-Horse Power.*

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|---|---|---|
| 3½ lbs. of coal per horse power per hour = 45 lbs., at 5 dols. 25 cents per cwt. . . . . | 13 c. .. | 0s. 6½d. |
| Wages of engineer at 3 dols. per day . . . . . | 30 „ .. | 1 2½ |
| Total cost per hour . . . . . | 43 c. .. | 1s. 9d. |

Lubricating I have left out of consideration, as in each case it is about the same. In the indirect saving in favour of the gas-engine is the reduction of 1 per cent. in the insurance rate, and the smaller cost of the engine over boiler and steam-engine. The same gentleman has also a 1½-horse power engine in a newspaper office, running about 3½ hours per day, and consuming 1000 feet of gas per month; the price of gas being 2 dols. 75 cents (11s.), to which, however, should be added the interest on the money invested (say 250 dols. at 6 per cent. per annum), 1 dol. 25 cents per month, and say 50 cents (2s.) for oil and wear and tear, making the total cost per month 4 dols. 50 cents (18s.). It is stated that this engine effects a saving of one man's labour; allowing that it saves only one-half of this work, we still find its user gains 10 dols. 50 cents (£2 2s.) per month. Several of the other members of the Association gave their experience with this motor, and wherever it is introduced complete satisfaction seems to be given. According to the figures produced by these gentlemen, I find the consumption of gas per nominal horse power per hour to be, on the average, 12 feet; but doubtless many of the engines under consideration were not worked up to their full power, or the consumption would have been greater.

The transition to gas-stoves is a natural one, and it is a subject to which many of the members of this Association have given a good deal of time and attention. The success with which they have met should be a source of encouragement to themselves, and an incentive to others. Mr. Starr was able to state that with 500 dwelling-house consumers he had 500 who used gas more or less for cooking—a record that few, I think, can equal. Again, taking the average of the figures presented by the members, and adopting 2 dols. 20 cents (9s.) as the price of the gas, I think the expense of cooking by gas to be about 1 cent. (½d.) per head per day, with a family of four or five persons.

At the meeting of the Central New York Gas Engineers Association, Mr. Humphrey, of Dannsville, read a paper on oil gas, to which I will briefly refer, not that I approve of the process, but because, with the exception of diluting the gas with air, it closely resembles the process by which gas is made in many of our Western towns, especially where wood is plentiful. The retorts are "throughs," 8½ by 7 inches in cross section, and 5 feet long, the inlet for the oil being at one end, the stand-pipe at the other. Into the retort a stick of hard wood is thrust, and when this is charred the naphtha stream is turned on. This oil and wood gas then passes through the condenser, purifier, and meter to the holder. In passing out to the mains, the gas is sent through an apparatus which mixes air with the gas in such proportion that when it issues therefrom it is composed of 6 per cent. of gas and 4 per cent. of air. To purify 50,000 cubic feet of the pure gas, one bushel of lime and two bushels of charcoal are required; for 1000 feet of the pure gas, 14·13 gallons of naphtha and 14·80 lbs. of wood are used; while for the same quantity of diluted gas, 10 gallons of naphtha and 11 lbs. of wood are required. Gas coke is used as fuel under the retorts. The gas seems to be permanent, as the superintendent says that in 2½ years there has not been any condensation in the drips. The unaccounted-for gas is less than 2 per cent. All the work is performed by the superintendent and one man, and they are not kept continually busy, the make of gas being about 1 million feet a year.

I now come to a matter that has received a good deal of notice in some of the technical journals here. Though it occurred a few months ago, I deem it of sufficient importance to lay it before your readers. On the night of the 16th of April many of the public and private lights, chiefly the former, in several cities in the vicinity of New York, went out. The cities where the lights were affected were Newark, Jersey City, New York, and Brooklyn. Newark is distant from New York about twelve miles, while Brooklyn and Jersey City are divided from the same city by the East and North Rivers respectively. The morning following the night in question, the managers of the gas-works in these cities found that many of their lights had gone out during the night; each naturally ascribed it to some local trouble, and not till it was learned that several cities had been similarly affected was a common cause looked for. At the New York Observatory the barometer rose suddenly at midnight—the time at which the trouble occurred—from 29·59 to 29·71 inches, and to this increase in the pressure of the air is ascribed the extinguishing of the lights. Just before midnight a sudden tornado passed over the section of the country in which these cities are situated. In Newark proper, and in one of the suburbs supplied by separate works, many of the lights went out, while in another outlying district the lights were undisturbed. In New York it is to be noted that the trouble extended, to a greater or less degree, over an area supplied by five different Companies. If this increase in the atmospheric pressure explains the phenomenon, then a very slight difference in that pressure between the governor and the point of ignition would cause the lights to go out, for it is the pressure at the burner we have to consider, and not that in the mains; and leaving quite out of the question the specific gravity of the gas, this pressure is only about 4-10ths of an inch of water. But, for the sake of argument, I omitted an important factor—namely, the specific gravity of the gas. Now, if we were to supply gas only to burners on the same level as the governor, I take it we should only have to apply sufficient pressure to the gas to overcome the friction in the pipes, and to cause the flame to assume its proper shape. It is to be remembered that the lights in these cities did not merely alter their shape, but were entirely extinguished. If my idea is correct, the gas, having once reached the lamps, would issue from the burners by virtue of its specific gravity, even though the pressure at the works were removed. If such were the case, how would an increase of the atmospheric pressure at the burner affect the lights? Would it cause them to go out? According to my idea, the reverse would be the case. When we speak of gas having a specific gravity of ·450, we are comparing it with air at its normal pressure of 30 inches, which we call 1. If the barometer rises above that point, would not the gas be relatively lighter? That is, if the gas, by virtue of its specific gravity, issues from a burner with a certain pressure when the barometer is at 30 inches, would it not issue with an increased pressure when the barometer rises above that point? In other words, would not the ascension pressure of the gas be greater? I confess I cannot see how this increase of the atmospheric pressure could have caused these lights to go out, and I am more inclined to think it was caused directly by the wind. The subject is of some interest, for, were such occurrences to happen with any frequency, many serious accidents might occur on account of the gas being extinguished, and then flowing out unignited when the trouble had passed over.

## THE TRANSFER OF THE NOTTINGHAM WATER-WORKS TO THE CORPORATION.

A General Meeting of the Shareholders of the Nottingham Water-Works Company was held on Monday, the 5th inst., for the purpose of winding up the affairs of the Company on the transfer of the undertaking to the Corporation. Mr. R. Birkin, the Chairman of the Company, presided, and the Corporation were represented by Alderman Bowers and the Town Clerk (Mr. S. G. Johnson).

The Clerk (Mr. S. Maples) having read the notice convening the meeting, the Report of the Directors was presented. It stated that since the last ordinary annual meeting of the Company, the Nottingham Improvement Bill had received the Royal Assent. Under the clauses contained therein the Corporation had become the purchasers of the Company's undertaking, and the transfer was made on the 14th of May last. Since then each Shareholder had received, in exchange for his share certificates, the Corporation annuity certificates entitling him to the following percentage annuities on the nominal amount of his shares—viz., from March 25, 1880, to March 25, 1881, to an annuity of 6½ per cent.; from March, 1881, to March, 1882, to an annuity of 6¾ per cent.; and from March, 1882, and thenceforward in perpetuity to an annuity of 7 per cent. When the transfer was duly effected, and all the current debts of the Company had been discharged, a sum of £8188 15s. 5d., remaining to the credit of the Company, was, with the undertaking itself, handed over to the Corporation; and thereupon the Corporation, on their part, handed to the Directors an agreed sum of £10,000 in lieu of a quarter's rental earned by the Company on and before the 25th day of March, 1880, and an additional sum of £20,000 which had been offered by them in writing specifically "for the purpose of paying compensations." Nothing, therefore, remained to be dealt with by the Company except the balance of the latter amounts. Since the last annual meeting the Company had issued 854 new £50 shares, being the number limited by the Corporation Purchase Act. The Directors had paid the Shareholders the customary half-yearly instalment of dividend in respect of the profits earned by the Company up to and inclusive of the 25th of March last, for which they asked the confirmation of the meeting, and they also asked that the interim half-

yearly instalment of dividend paid by the Directors in October last, be ratified and confirmed. Since the passing of the Nottingham Water-Works Act, 1878, the Directors had carried out some important portions of the extensions thereby authorized, and had also constructed a large service reservoir in the parish of Papplewick, which was successfully completed and opened for use in March last. The revenue of the Company at the time of its transfer was in a prosperous and rapidly increasing condition, and the works were in an excellent and thoroughly effective state. The Directors recommended that a sum of £16,000 be appropriated to paying the Shareholders, on each £50 on the nominal value of their shares, a bonus of £2, and a proportionate amount for any holding of less than £50, this being equivalent to a further dividend of 4 per cent. on the total share capital of the Company. Out of the additional sum of £20,000 already mentioned, the Directors had paid £5170 in compensations to the various officers of the Company; and after paying the expenses of winding-up, and such other charges as might be payable by the Company, and were not provided for by the Nottingham Improvement Act, 1879, and making such other payments as the Shareholders might direct, the final balance would be divided amongst the Shareholders on the winding-up and dissolution of the Company, in accordance with the provisions of the Nottingham Improvement Act, 1879.

The Chairman, in moving the adoption of the report, said it was so full that he hoped it would not be necessary to have much discussion about it. He thought, however, that he ought to draw attention to the fact that at the time when the report was prepared it was deemed to be a desirable thing to retain in the hands of the Shareholders, under the management of the present Board, a small sum of money as a sort of protection-fund for the interests of the Shareholders. On the more matured consideration of the Directors, however, it was thought that this looked very much like providing a fund to watch the Corporation, and therefore the Directors had withdrawn the fund altogether, throwing it into whatever balance there might be for division amongst the Shareholders. There was also another matter which he felt perfectly sure would meet with the approval of the Shareholders. He need not say that during the negotiations which had taken place between the Directors and the Corporation a great deal of trouble had been necessarily gone through by the Board, and he did not suppose the Shareholders would think the Directors had done wrong in suggesting a remuneration to themselves from the rest of the fund. They therefore originally proposed that a certain sum be paid to them for compensation; but had since decided to leave the matter entirely in the hands of the Shareholders.

Mr. Brewill seconded the motion.

Mr. Brewster did not agree with the suggestion in the report as to the amount of money which it was proposed should be distributed to the Shareholders; and, therefore, if that question were to be brought on as a distinct resolution, he must ask that it be understood that in agreeing to the report the Shareholders only assented to it subject to dealing differently, if they thought well, with the question of the distribution of the moneys of the Shareholders when it came on. Another thing arose upon the report, and that was as to the compensation which the Directors had awarded to the officers of the Company. They were told that a sum of £5170 had been awarded to the officers of the Company, and he thought it was due to the Shareholders to know what were the amounts of the compensations. The amount paid in compensation on the transfer of the Leicester Water-Works from the Company to the Corporation was only £1000; the total amount of compensation paid in Derby was £2000. If there were any special reasons why the officers of the Nottingham Company were entitled to more than in these two cases, the Directors should let the Shareholders know.

The Chairman said there would be a special resolution with regard to the £16,000.

Mr. Brewster said that in assenting to the report he wished it to be understood that the Shareholders only assented to it subject to the settlement of the amount which they would that day resolve to be distributed among the Proprietors. All that really concerned the Shareholders was the application and distribution of some of the sum of £35,000. He would like to know what principle the compensation was based upon.

The Town Clerk asked whether it was the intention that day to dispose of the whole of the balance of £30,000, or did the Shareholders propose to keep a sum of money in hand. The Directors proposed to divide £16,000 among the Shareholders; they proposed to devote £5200 to compensations; but that left a sum of over £8000 undisposed of. Supposing, therefore, a portion disposed of in favour of the Directors, there would still be a balance. Did they intend to dispose of that balance? because he would certainly oppose the carrying of any report which did not that day finally wind up the Company.

The Chairman: With regard to the compensation of the officers, this matter rested absolutely in the hands of the Directors, and considering the magnitude of the Company, their impression was that the compensations awarded to the staff were really of a very small amount indeed. There were men who had been in their service for 45 years, and others for various periods, but no compensation had been given to any servant who had not been employed by the Company at least ten years. As to the question of the Town Clerk, in reference to whether they were going to wind up the Company finally that day, as it was impossible to know what the cost of winding up would be until the Company was wound up, they could not finally divide that day, but whatever was left would come to the Shareholders.

The motion was then put and carried.

The Chairman next moved that the instalment of dividends paid since the last ordinary meeting be confirmed. He said this was not only customary but legally necessary, and should be done.

The Town Clerk seconded the motion, and it was put and agreed to.

The Chairman said the next resolution he had to propose was that the sum of £16,000 be divided amongst the Shareholders of the Company in proportion to their several interests in the capital thereof. The Shareholders would see from the report that a balance remained at their disposal. It would be necessary to retain a certain sum for the purpose of paying the expenses attending the winding up of the Company. The £16,000 he looked upon as practically a dividend on account, though it was not a final dividend. The amount he proposed would give about £2 to each share of £50, and 15s. 5d. to each share of £19 5s.

The motion having been seconded,

Mr. Brewster said that, as he had intimated before, the resolution was not satisfactory to him, and he intended to move an amendment as to the amount of distribution. The Shareholders had a sum of £30,000 to dispose of, out of which the Directors took in round numbers £5000 for compensation to officers and servants. This would leave roughly £25,000. He could see no necessity for any considerable amount of money being retained in hand, and he therefore proposed as an amendment—"That out of the moneys paid by the Corporation to this Company there be now distributed amongst the several Proprietors of the Company a dividend or sum after the rate of 5 per cent. upon the amount of their shares respectively, or in the capital of the Company; that is to say, 50s. upon or in respect of each £50 share, and 17s. 3d. upon or in respect of each £19 5s. share, and that the same be paid on the 1st day of August next, to all such Proprietors as are entitled to receive the same." This would leave a sum of something like £5000 in hand. He proposed also that the meeting of that day should be adjourned for three months, by which time all bills of costs could be made out and brought before them, so that there would be no difficulty about dividing the balance.

The Chairman said so far as the Directors were concerned they were in exactly the same position as the Shareholders. If there was a sufficient sum left in hand to meet emergencies the Board would adopt the amendment.

Mr. Gibson (a Director) seconded the amendment.

The Chairman said the resolution as it was now before the meeting involved the distribution of £20,000, instead of £16,000, among themselves, but he objected to the adjournment for three months.

Mr. Brewster asked the Directors to fix their own time.

After some further discussion as to the practicability of completing the necessary preparatory work before the distribution and final meeting, the resolution was put and declared carried unanimously.

Mr. Brewster, referring to the Directors compensation, said he had considered the matter with the intention of doing what was strictly right to all parties concerned. He therefore proposed a resolution to the effect that out of the moneys supplied to the Company by the Corporation of Nottingham, the sum of £2000 be set apart for compensation to the Directors of the Company at the date of the transfer to the Corporation, to be applied or divided amongst them rateably in proportion to their length of service with the Company respectively during the period which had elapsed since its incorporation in the year 1845, but with certain specified variations.

Mr. Gregory seconded the motion.

The Chairman said the subject now before the Shareholders was rather a delicate one for him to say much about. He thought that for a Company possessed of £400,000 worth of stock with a market value of something like £700,000, the amount proposed as compensation to the Directors was certainly very small indeed. However, he had said that the Directors had felt disposed to leave the matter in the hands of the Shareholders, and they would do so. Still he must say he felt some little disappointment at the amount; but if it was their will that the £2000 should be divided among the Directors in the proportions suggested in the resolution, he was in their hands, and unless an amendment was proposed he would put the resolution to the meeting.

Mr. Wild moved as an amendment that the sum of £3000 be substituted for the £2000 in Mr. Brewster's motion.

Mr. Walker seconded the amendment, and it was carried.

The meeting was then adjourned till the 4th of August.

## THE WATER SUPPLY OF WALTON-LE-DALE.

### Local Government Board Inquiry.

The Walton-le-Dale Local Board having applied to the Local Government Board for authority to borrow £10,000 for the purpose of providing a water supply for their district, Mr. R. Morgan, C.E., one of the Local Government Board's Inspectors, held an inquiry in Walton on the 14th inst., in reference to the application. Among those present were Mr. R. Calvert (Chairman of the Local Board), Mr. W. Ascroft (Clerk), Mr. Trimble (Medical Officer), Mr. Tomlison (Engineer), and Mr. De Rance (of the Geological Survey).

The Inspector having opened the inquiry,

Mr. Ascroft said that, as Clerk to the Local Board, it devolved upon him to supply the Inspector with any information he might desire. Plans and estimates of the proposed works had been sent to the Local Government Board, and from these it would be seen the Local Board purposed adopting a pumping scheme, and drawing the water from the millstone grit. The scheme was originated by Mr. De Rance, and this gentleman was present to give his opinion upon it. The works were expected to supply something like 400,000 gallons per day, and Mr. Tomlison, the Engineer, had made preparations on that basis. The population of the district was estimated at 9475; in 1871 it was 8187; and in 1861, 7383. The rateable value for highway purposes was £38,868, and for general district purposes £28,168. At present the Board had borrowed £500 for the purpose of lighting the district, and had repaid a small sum. They had also borrowed, on the security of the rates, £2000 for the erection of new offices and other buildings for the purposes of the Board. The trade of the district was mainly manufacturing, there being ten large cotton mills and print works. At present the district was without any supply of water whatever, except what was derived from pumps, and this was of a very objectionable character. The place was as badly off for water as it could well be. Another reason why the Local Board wanted the work done was that they needed sewerage works, and they did not feel justified in providing them until they had a water supply. He might say that no gravitation scheme of supply was available. The district was of a moderately agricultural character, and the Board were afraid of the water being polluted. Under these circumstances, they consulted Mr. De Rance, and upon his advice the present scheme had been prepared. It was proposed to sink a well on the estate of Lord Chesham, at Brindle, which was just outside the district, and the Board had made arrangements with his lordship. The proposed reservoir would not hold an entire day's supply of water, but it was not anticipated that the district would require as much as 250,000 gallons at present. The Board would probably sell some of the water for trading purposes. A bore-hole of small diameter had been sunk to a depth of 300 feet, but the Board proposed to sink a well of larger diameter, and they would be guided by expediency in determining how far they would go down.

Mr. De Rance said the Board would have to go down quite 2000 feet before they came to the carboniferous limestone. He thought there was no question about the Board finding a spring, because they knew it was there. His idea in suggesting to the Board the sinking of the well was to obtain access to the water upon the surface of the millstone grit, and he suggested that the depth should be 300 feet or something less. There appeared strong reason for believing that, after pumping, the water would stand about 125 feet from the surface. The rainfall of the locality was about 40 inches per year, and he reckoned that one-fifth of it would get to the rock. This would give an average of 320,000 gallons per day. If they reckoned one-fourth, as they usually did in these cases, they would have 400,000 gallons, and he thought the area in question might perhaps yield more than this. The only unfortunate circumstance about the present boring was the occurrence of limestone; but, judging by experience, the lime which was most soluble would very soon be washed out. There seemed to be a possibility that the 12 degrees of hardness of the water would be lessened after they had been pumping some time; but the water was not so hard as that at Canterbury, and many other places, and it was altogether free from organic impurity, as certified by Dr. Tidy.

Mr. Tomlison said they had pumped 60,000 gallons of water per day with a 4-inch pump in a 6-inch bore-hole, and they could not exhaust the supply at this rate. There was no opposition whatever to the scheme.

Mr. Ascroft said there was a strong feeling in the district in favour of it, as the inhabitants were anxious to have a supply of water. The Board

proposed to borrow the money from the Public Works Loan Commissioners, and they wanted the longest possible period they could have for its repayment—say 50 years. They were prepared to commence the work as soon as the scheme was sanctioned.

The INSPECTOR said he did not think the Local Government Board would grant more than 30 years, but he hoped to be able to send in his report on an early date, in order to expedite matters.

The inquiry then closed.

## GLASGOW CORPORATION WATER SUPPLY.

A Meeting of the Glasgow Water Trust was held on Thursday, the 15th inst., when an abstract of the accounts of the Water Committee, for the year ending the 28th of May last, was presented. This gave the following particulars:—

| | | | | | | |
|---|---|---|---|---|---|---|
| The revenue for the year amounted to . | | | | £138,993 | 12 | 0 |
| The revenue from the river supply works was . . . . . | | | | 1,903 | 18 | 0 |
| | | | | £140,897 | 10 | 0 |
| Dr. balance from previous year. . . . | | | | 246 | 1 | 8 |
| | | | | | £140,651 | 8 | 4 |
| The expenditure, including annuities and interest, amounted to. . . . . | | | | £111,691 | 3 | 8 |
| The expenditure for river supply works was . . . . . | | | | 5,253 | 2 | 4 |
| | | | | | 116,944 | 6 | 0 |
| | | | | | £23,707 | 2 | 4 |
| Carried to sinking-fund account . . . . . | | | | | 15,703 | 3 | 5 |
| Balance carried to revenue account—year 1880-81 . . | | | | | £8,003 | 18 | 11 |

The total revenue for last year was £140,897 10s., against £140,578 11s. 6d. for the previous year, showing an increase of £318 18s. 6d.; while the total expenditure for last year, exclusive of the sum carried to sinking-fund was £116,944 6s., against £125,728 11s. for the previous year, being a decrease of £8784 5s. The amount added to capital account during the past year was £61,531 19s. 6d. The sinking-fund set apart for the redemption of mortgages or annuities now amounts to £181,098 16s. 10d.

The quantity of water sent into the city and district during the past year averaged as follows:—From the Loch Katrine works, 34,038,249 gallons per day; from the Gorbals works, 3,258,152 gallons per day—together, 37,296,401 gallons. Average for 1878-79, 37,636,265 gallons per day—or a decrease, 339,864. The quantity of water supplied during the year from the river supply works averaged 1,624,031 gallons per day, reckoning six working days in the week. The average for the last few months, however, was about 2,270,000 gallons per day.

## METROPOLIS WATER SUPPLY.

The following is Dr. Frankland's report of his analyses of the water supplied to London during June:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Colne Valley, 1·4; Kent, 1·5; Tottenham, 1·6; New River, 1·7; East London, 2·5; Lambeth, 2·6; Grand Junction, 2·9; Southwark, 3·0; Chelsea, 3·1; West Middlesex, 3·1. The Thames water delivered by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was of better quality in June than in May, but the water delivered by the Grand Junction and Lambeth Companies was slightly turbid. The Lea water, delivered by the East London Company, was somewhat superior to Thames water; but that supplied by the New River Company was of much better quality, and nearly equal to spring water. The deep-well water supplied by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was of its usual excellent quality for dietetic purposes, and that sent out by the Colne Valley Company was suitable for all domestic purposes, having been softened before delivery. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; New River, clear, nearly colourless; East London, Southwark, West Middlesex, Chelsea, clear, very pale yellow; Grand Junction and Lambeth, slightly turbid, very pale yellow."

*Results of Analyses expressed in Parts per* 100,000.

| Companies or Local Authorities. | Total Solid Matters. | Organic Carbon. | Organic Nitrogen. | Ammonia. | Nitrogen, as Nitrates and Nitrites. | Total combined Nitrogen. | Chlorine. | Total Hardness. |
|---|---|---|---|---|---|---|---|---|
| *Inner Circle.* | | | | | | | | |
| Thames— | | | | | | | | |
| Chelsea . . . . . | 24·34 | ·134 | 051 | 0 | ·141 | ·192 | 1·6 | 19·0 |
| West Middlesex . . . | 25·58 | ·141 | ·044 | 0 | ·158 | ·202 | 1·5 | 19·4 |
| Southwark . . . . | 26·60 | ·138 | ·041 | 0 | ·107 | ·148 | 1·5 | 19·4 |
| Grand Junction . . . | 25·40 | ·143 | ·030 | ·004 | ·164 | ·197 | 1·5 | 19·6 |
| Lambeth . . . . | 27·82 | ·124 | ·032 | 0 | ·162 | ·194 | 1·5 | 20·6 |
| Lea— | | | | | | | | |
| New River . . . . | 27·96 | ·077 | ·023 | 0 | ·176 | ·208 | 1·6 | 20·0 |
| East London . . . . | 27·24 | ·121 | ·029 | 0 | ·116 | ·145 | 1·8 | 20·0 |
| Deep wells—Kent . . . | 43·74 | ·070 | ·017 | ·003 | ·422 | ·442 | 2·5 | 25·7 |
| *Outer Circle.* | | | | | | | | |
| Colne Valley . . . . . | 15·38 | ·066 | ·016 | ·004 | ·326 | ·346 | 1·5 | 8·4 |
| Tottenham Local Board . | 41·10 | ·077 | ·019 | ·060 | 0 | ·069 | 2·8 | 20·2 |
| Corporation of Birmingham* . . . . . | 25·68 | ·186 | ·019 | ·002 | ·253 | ·273 | 1·9 | 13·0 |
| Corporation of Glasgow† . | 2·94 | ·155 | ·015 | ·003 | ·006 | ·021 | ·66 | ·95 |

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

*Note.*—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

PROPOSED PURCHASE OF THE DROGHEDA WATER-WORKS BY THE CORPORATION.—The subject of the purchase of the Drogheda Water-Works is at present engaging the attention of the Corporation, and an offer has been made by them to the Directors of the Water Company for the purchase of the entire concern. At a recent meeting of the Corporation a reply was read from the Directors of the Company, stating that they would have no objection to arranging for the purchase of their works at a fair valuation, the expenses in connection with the transfer to be borne by the Corporation. The subject will be considered at the next meeting of the Town Council.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

On Wednesday last the Shareholders of the Wick and Pulteneytown Gaslight Company held their annual meeting—Mr. Henderson, of Bilbster, in the chair. In the report by the Directors for the past year it was recommended that a dividend of 5 per cent. be paid, together with a bonus of 2s. per share, and regret was expressed that the Directors had been unable to make a reduction in the price of gas in consequence of a large expenditure made during the past year, and which they contemplate making during the ensuing year on their works. They looked forward, however, with confidence to a substantial reduction being made at the next annual meeting, and not improbably at an earlier date.

At the annual meeting of the Nairn Gas Company, held on the 19th inst., a report was submitted from the Directors recommending the payment of a dividend of 5 per cent. It stated that the past year had not been a favourable one for the Company, as they had had to bear a considerable loss from damage to the street-mains, caused through drainage operations. The report was unanimously agreed to.

The Shareholders of the Montrose Gaslight Company held their annual meeting last Wednesday—Mr. Francis Aberdein, of Keithock, Chairman of the Company, presiding. The Secretary and Treasurer (Mr. A. Melville Watt) read an abstract, and thereafter the report of the Directors, which stated that the extensive additions and alterations which have for some time been in progress at the works would soon be completed. A recommendation by the Directors that a dividend be declared at the rate of 7½ per cent. on the shares (valued at £40 each) was approved of. Mr. C. Durie moved that a balance-sheet be printed and circulated annually amongst the Shareholders, as was done by other Companies. Mr. John Reid, late Manager of the Leith Gas-Works, and a former Manager of the Montrose Gas-Works was present, and said that it was not usual for gas companies to do so. The books were open to the Shareholders if they chose to look at them, and he suggested, seeing there was a probability of the works being acquired by the Town Council, that no action should be taken in the matter. Mr. Durie's motion was not seconded, but it was left to the discretion of the Directors to print a balance-sheet if they saw fit. The four retiring Directors were re-elected.

The Gas Commissioners of Kirkintilloch had their accounts for the past year under consideration at their last monthly meeting. The statement made showed that during the two years that the works had been under the charge of the Commissioners there had been made a gross profit of £1011 12s. 2d.; and, after paying £800 to account of loan and other items, there was a net profit of £290 remaining. It was agreed to use the major portion of this sum in reducing the price of gas from 5s. to 4s. 7d. per 1000 feet. Provost Sandeman, in moving that the accounts be accepted and printed, called attention to their very satisfactory position, and expressed his pleasure at the price of gas being reduced from a legitimate surplus. It showed the care with which the trust had been administered by the Gas Committee, and he hoped the inhabitants of the burgh would appreciate their services. He moved a vote of thanks to them. It was agreed to make an increase in the salary of the Manager (Mr. Duncan Jeffray).

When submitting the annual financial statement of the Johnstone Gas Commissioners to the last monthly meeting of that body, Provost Donald drew attention to the pleasing fact that they were in the position of having a surplus, after paying all the expenses of the past year, amounting to £510 15s. 5d., which was, he said, a larger balance than their predecessors ever had; and he thought the Manager of the works (Mr. Wyllie) should be complimented for what he had achieved in the face of so many disadvantages. He concluded by calling the attention of the Commissioners to the necessity of introducing some new machinery, in order still further to increase their profits. In reply to one of the Commissioners, he remarked that there was not any likelihood of the price of gas being raised, and he thought that by another year they could have a slight reduction.

In submitting the annual statement of accounts at the last meeting of the Port Glasgow Town Council, Provost Sommerville, on the part of the Gas Committee, spoke in congratulatory terms as to the management of the gas supply undertaking of the town. Bailie Hunter, as Convener of the Committee, endorsed the remarks made by the Provost. He said the members of the Council were aware that in 1878 it was considered necessary that, if possible, certain alterations should be made to work out some improvements, and, if possible, leave the balance on the right side. A good deal of time and money was spent then, and he found that at the end of 1878-79 there was a suspense account of over £264. From the balance shown this year they had met the suspense account to the extent of £164, and were now to the good somewhere about £311. Not only so, but through the great care of their Superintendent at the gas-works the leakage had been much reduced. In 1878 the amount of leakage was amongst the highest, he dared say, of any gas-works in Scotland, running somewhere about 25 per cent. He was very glad to be able now to inform the members that it was reduced to about 15 per cent. Some of them would recollect that at a previous meeting it had been said that if they turned the leakage into money, there was a certain sum lost year by year. If he were taking such a basis for his calculations—which they all knew was an erroneous basis—he would say that they had saved from £250 to £260 this year in that way. He expressed his belief that the leakage would be still further reduced.

Considerable progress has been made in connection with the question of unaccounted-for gas in Greenock, and the Corporation Gas Committee confidently anticipate that, when the adjustments are completed which are at present in progress, they will have a different tale to tell at the end of twelve months to the credit of the gas-works.

The statutory annual meeting of the Dumfries Town Council, in its capacity of Gas Commission, was held on Monday, the 12th inst.—Provost Shortridge presiding. Gratifying reports were submitted as to the result of the past year's working. The total receipts had amounted to £8971 19s. 2d. This enabled the Committee to pay off a balance of £1006, which stood at the debit of the profit and loss account, to pay the interest on the loan, and a further instalment of £625 towards the repayment of principal; then set aside a sum of £150 for the establishment of a depreciation-fund, and to carry forward a balance of £492 16s. 6d. to the credit of the profit and loss account, which they recommended should be applied to the reduction of the price of gas. It appeared from the accounts that a saving of £1961 had been effected in the quantity of coal carbonized, while there had been an increase in the gas-rental of £1040. On the motion of Treasurer Lennox (Convener), seconded by Mr. Paterson, it was resolved to reduce the price of gas to all consumers from 5s. 10d. to 5s. per 1000 cubic feet. A gratuity of £30 was voted to the Manager (Mr. Malam), and smaller sums to several of the other officials employed at the works.

At the annual general meeting of the Lockerbie Gas Company, held on Monday, the 19th inst., the annual dividend was declared at the rate of 7 per cent., being the same as at the previous annual meeting.

An immense amount of business was done in the Glasgow pig iron market during the past week, and the close on Friday was the highest point touched—namely, 54s. 9d. cash, and 54s. 10½d. one month fo buyers. There is still an absence of improvement in the coal trade.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Except that the extremely low point to which prices have now fallen has a tendency to restrain the almost reckless pressure for sales which has been going on for some time, there is little change to notice in the coal trade of this district. There is no material increase in the requirements for consumption, and the belief seems to be entertained by many of the large colliery proprietors that a steadier tone can only be imparted to the market by a considerable reduction of the output. There is no question that the present means of production are far in excess of any probable requirements for some time to come, and the effect which this will naturally have in keeping down prices has, no doubt, influenced many sellers in the long forward tenders for gas coal contracts which have recently been made. With regard to this branch of trade, contracts are being based upon tenders for deliveries extending over three years at extremely low figures, and in other classes of round coal, buyers who are prepared to take quantities are able to command pretty nearly their own terms, the demand, both for house fire and manufacturing purposes, being of a very limited description, with needy holders of stocks anxious to secure orders at almost any figure. It is scarcely possible to quote any really fixed market price, as there is a great deal of private bargaining for anything like sales in bulk; but so far as any quotations can be given, they are about as under:—Good screened round coal, 7s. to 7s. 6d.; seconds, suitable for house fire or gas purposes, 5s. 6d. to 6s. 3d.; and common screened coal for steam purposes, 4s. 6d. to 5s. per ton. For engine fuel the market is generally steady at late rates, there being no pressure to sell slack. For burgy prices range from 3s. 9d. to 4s. 3d. per ton at the pit; and for slack, 3s. 3d. to 3s. 9d. per ton.

In the shipping trade there is very little doing, and Lancashire steam coal delivered at the ports on the Mersey is being offered at from 6s. to 6s. 6d. per ton.

The improvement in the iron trade continues, prices being very firm with an upward tendency, although the actual sales do not yet largely increase. Lancashire makers of pig iron have indeed, if anything, been doing less since they advanced their prices, but some fair quantities of iron could have been sold at previous rates. Local makers, however, are holding for 50s., less 2½, for No. 3 foundry; and 49s. for No. 4 forge, delivered into the Manchester district. Finished iron makers are getting rather busier, and there is less pushing for orders at under list rates; but bars delivered into the Manchester district can still be bought at about £6 per ton.

## THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

During the past week the coal trade of this district has been fairly active, though not to anything like an unusual extent, or to such a degree as to warrant belief in the minds of colliery owners that the brighter aspect which is agreed on all sides to be manifestly evident in the iron trade will be very speedily extended to them. Things, however, are decidedly more satisfactory than they were a month back, inasmuch as the practice of underselling then prevalent is but little complained of, and competition on the part of neighbouring producers is less keen. Scarcely any of the local pits are in full work, and the output might be greatly increased by those who are best off for orders. A steady trade at slightly improved rates is nevertheless maintained, and notwithstanding the persistence of those who continue to speak in the most despairing manner of the local trade, business is, on the whole, better than has been depicted. During the months of April, May, and June, several furnaces were blown out, whereby a perceptible reduction in the demand was noticeable. Importations were, however, cut off in a similar ratio, and the coalowners were less sufferers than were the ironmasters. Should the greatly improved prospects in the latter department continue, the demand for furnace and forge coal will be greatly extended. For best deep coal, orders are as numerous as they have been for several months past. In the Cannock Chase district efforts are being made to secure a better agreement on the part of the men for the ensuing part of the year, than that which expires on the 12th of next month. By the old agreement the allowance of coal hitherto given will be withdrawn after that date. The wages rate, it is held, should be based on the actual selling price of coal. By the last agreement it was based on the minimum—viz., 2s. 3d. per day on the average price of 8s. per ton for best deep and shallow coal.

The last week's iron markets were well attended, and a cheerful business tone prevailed. Quotations were considerably firmer, and for all kinds of finished iron inquiries were numerous. Merchants show a disposition to secure parcels at the advanced rates, though the prices of the previous week were fought for. An increase of 2s. 6d. and 5s. over those prices was maintained. The ruling price for forge pig iron is 10s. to 12s. above the rate of a month ago, and Staffordshire bars (common) run as much as £1 and £1 5s. over the prices of those then quoted. All-mine hot-air pigs are 5s. higher than they were a fortnight back, and part-mine have increased in like manner. Most makers now have a good stock of orders on hand, and there is every probability of the mills going full time for several weeks to come.

## THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

During the past fortnight great changes have come over some of the collieries in the South Yorkshire coal-field, owing to the alterations brought about by the contracts for various gas coals and other kinds of fuel. The pits scarcely ever varied more than they do at the present time. Many collieries are working short time, making, in fact, one and two days per week; whilst at Wharncliffe Silkstone, Darfield Main, Carton Wood, Lundhill, Monkton Main, and other places, five and six days per week are being worked.

The house coal trade in both the South and West Yorkshire districts is very moderate indeed, and in addition to the slack trade prices of both Barnsley and Silkstone house coal are very low. The tonnage rate to London is still the subject of conversation, and it is said the example of the East Derbyshire coalowners will be followed by the Yorkshire proprietors, who will endeavour to prevail upon the Great Eastern or some other railway company to come into the district. There is only a limited demand for coal for Lincolnshire, the Eastern Counties, and other markets to which house coal is usually sent.

In both districts the quantity of steam coal produced is just now pretty large, the exports from the various Humber ports holding well up. A good deal of hard coal has of late been used for smelting purposes; but the demand is not quite so good. Locomotive coal is, for the most part, supplied on account of contracts to the various railway companies. Some of the pits seem to have fared very well; but the low rate at which supplies were secured prevents much profit being made even at collieries where the royalties are low, and the owners have extra advantages.

The coke trade is beginning to flag, and it is rumoured that some ovens will be put out. There is, however, a very large output at most places in South Yorkshire, several of the leading firms having close upon 100 ovens each at work. In the face of the somewhat quiet trade, many colliery owners are still pressing on with the erection of new ovens which were commenced before the slackness was visible. The furnaces in the North Lincolnshire iron-smelting district are taking a good deal of what is produced in the locality, but the blowing out of furnaces indicates that a further falling-off is almost certain. Prices, it may be stated, are lower, but a large proportion of what is sent away is supplied by contract.

As mentioned in my last report, the low prices which prevail, coupled with the very quiet state of trade, are causing coalowners to revise their working expenses with a view of decreasing their outlay. At several places, including the Barrow Colliery, Strafford Main, and Stanhope Silkstone, the men, or a portion of them, are either under notice or have been discharged. The workmen employed at the Barrow Colliery are given to understand that the firm will close a greater part, if not the whole of the colliery, they being able to procure fuel cheaper at their works at Barrow than they can send it from their own pits. Should this step be taken, it will seriously affect the district, the owners having quite recently erected close upon 400 houses for their workmen. The opinion of some people is that the iron trade presents a more cheerful aspect, but no alteration can be noted in the extra demand required. The production of pig iron has not diminished to any great extent, there being a full complement of furnaces in blast. Orders are, however, not pushed forward with the energy which was displayed during the early part of the year. The mills and forges are not over-well worked. There is a fair demand for heavy castings, but for lighter material the inquiry is very moderate. With regard to the Bessemer steel trade, the works in the South Yorkshire district are kept well employed; but ordinary foundry work is not over plentiful.

## THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There is no special change to note in the position of north country coals. Tonnage has rather run short for the Baltic, and merchants have a difficulty in placing orders. The Baltic gas companies are now desirous of increasing their stocks, and as the prospects of business home are highly unsatisfactory, it is probable that they will have to pay more in freight. Very little business is transacted coastwise. The principal shipments continue to be done by the gas colliery steamers and the large boats owned by gas coal contractors. The steam coal owners find it impossible to maintain current rates. Nominally they are only able to do so, as reductions are made in discounts. Prices of steam coals are about 6d. down. Best steam is not higher than 9s. per ton, less 2½ per cent.; but some collieries give 5 per cent. The prospects of the Northern coal trade for the autumn are very moderate indeed. The price of gas coals is unchanged. Second-class pits, in some instances, only work short time, and do a sort of irregular business. Coke has improved a trifle, but any upward tendency in prices is not very manifest. There is a better inquiry for small and manufacturing coals.

The freight market is extremely easy coastwise for gas coals, and very low rates are taken by small sailing ships. Country gas-works will not import any great quantity of seaborne coal until the conclusion of the wheat harvest, when cartage is more at command. Scarcely any steamers were engaged last week for London. Freights were low. Boats were not wanted for the North of France, and very little tonnage is being taken up by the Irish gas-works to load from the Tyne.

The Cleveland iron trade sustains recent improvements very satisfactorily. Lead is in better demand, and stronger in price. The importation of wood into the North of England is a moderate average. Prices remain steady, but an advance cannot be established.

The chemical trade of the North of England was very firm last week. Prices advanced 2 or 3 per cent. Stocks are low, and there is every prospect of an improved trade, as the market keeps strong in Liverpool.

BELPER WATER-WORKS COMPANY.—The ordinary half-yearly meeting of this Company was held on Wednesday last—the Rev. R. L. Lloyd in the chair. The report of the Directors presented showed a balance of £205 3s. 2d. in hand, and it was unanimously agreed to. The Company, which has been in existence for 20 years, now declared its first dividend, which was at the rate of 5 per cent. for the past half year.

THE PAYMENT OF DIVIDENDS FREE OF INCOME-TAX.—At the last meeting of the Shipley Local Board, it was resolved to try the question of the legality of the Directors of the Shipley Gaslight Company paying dividends free of income-tax. Exception was taken by some of the speakers to the amount of the fees paid to the Directors, which it was stated come to £500 a year, the profits divisible among the Shareholders being only £3100.

SUGGESTED PURCHASE OF THE FOLKESTONE WATER-WORKS BY THE TOWN COUNCIL.—At the meeting of the Folkestone Town Council last Wednesday, on the Finance Committee recommending the payment of certain accounts—among others that due to the Water Company—the Mayor called attention to the large amount of it, and said he felt that the time had now come when the Council might seriously consider the question of purchasing the works. He believed a great saving would be effected if they had the control of the water supply in their own hands; and he gave notice that at the next monthly meeting he would call attention to the subject.

PAISLEY CORPORATION WATER SUPPLY.—The annual meeting of the Paisley Water Commissioners was held on Thursday, the 15th inst., when it was reported that the income for the year ended the 15th of May last was £12,129 7s. 9d., while the expenditure was £14,146 18s. 5d., showing an excess of expenditure over revenue of £2017 10s. 6d. The amount of water-rates collected for the year in Paisley, Linwood, &c., was £11,225 5s. 4d. The amount collected in Johnstone and Elderslie was £1173 10s. 10d. The Committee agreed to recommend the Commissioners to continue the same rate as last year, which was 8d. in the pound for the domestic rate, and 1d. for the public rate. To defray the cost of the Glenburn and Upper Glen reservoirs they agreed to recommend the Commissioners to borrow £9000. The report was adopted, and its recommendations agreed to.

STOWMARKET GAS SUPPLY.—The *Suffolk Chronicle* says that the Directors of the Stowmarket Gas-Works, who recently invited tenders for leasing or selling the property, have accepted the tender of the former leaseholders, for a term of 14 years, at an increased rental of £95, making the present rental £335 per annum. This, with interest on about £1800, the sum awarded by the valuers to the lessees for improvements and extensions made during their last term, brings the total rental up to £430. The Local Board of Health who offered £6000 for the works subject to a small portion of land on which the larger gasholder stands being made freehold, have lost, in the opinion of many, a good opportunity of benefiting the gas consumers of the town, both as to lessening the cost of gas and applying the surplus to reducing the rates. It may be added, on the authority of a statement made by one of the Directors, that they would have probably been willing to accept £6500 for their property. As it is, however, the arrangement brings the Shareholders 8½ per cent. clear.

WASTE OF WATER IN PENZANCE.—At the meeting of the Penzance Town Council on the 14th inst., the Sanitary Committee reported that an

inspection of water-taps and fittings in the town had resulted in reducing the consumption of water in one district from 80 gallons per head per day to 40 gallons, in another from 60 gallons to 30; and that as soon as possible the meters are to be removed, in order that the consumption in other districts may be tested. Mr. James, who moved the adoption of the report embodying these facts, remarked that the present consumption of water was greater than the Council could afford, and unless the inhabitants assisted the Sanitary Committee by the greatest possible economy, it would be their disagreeable duty to give an intermittent supply by day. Mr. Coulson said the recent stringent inspection of fittings had resulted in a saving of 100,000 gallons of water daily, and more than 100,000 gallons could be saved in districts not yet inspected. With proper economy there need never be any fear that the water supply of Penzance would fall short.

THE SEWAGE OF PARIS.—It may be remembered that for some considerable time past the question of the disposal of the sewage of Paris has been under the consideration of the Municipal Engineers. Various schemes—chemical and other—having been tried for dealing with the refuse, but with not altogether satisfactory results, it was eventually determined, on the recommendation of M. Alphand, the Director of Public Works (whose report was given in the JOURNAL, Vol. XXXV., pp. 62, 98), to adopt an irrigation scheme on a tract of land at Gennevilliers, and to further convey the sewage to St. Germain for final treatment. Towards the end of April last the members of the Municipal Council, accompanied by M. Alphand, made an inspection of the locality and the works, of which it may be presumed they expressed their approval, for we learn that at the meeting of the Council on the 23rd ult. it was resolved to approve, firstly, of the continuation of the irrigation system in the fields of Gennevilliers, and the carrying of the sewage to the lower north-western part of the peninsula of St. Germain and adjoining farms, and the delivery of the sewage from the conduits to persons on their routes who shall be willing, by agricultural, chemical, or other means, to cleanse it at their own expense and risk for the sake of what they may be able to get out of it, subject to rules to be prepared; secondly, to ask the Government, in case the 1500 hectares (3700 acres) of land at present employed might be found insufficient for the purification of the sewage without annoyance to the neighbourhood, to take into immediate consideration the extension of the present proposal and the irrigation of other districts in the Valley of the Seine.

SIR WILLIAM HARCOURT AS CHAIRMAN OF THE SELECT COMMITTEE ON LONDON WATER SUPPLY.—The *Evening Standard* of the 19th inst. contained the following:—"The fretful porcupine is always delighted to seize the opportunity of sticking his quills into the unoffending traveller, and it is not only unkind but foolish of the porcupine to blame the traveller, and be rude to him because that victim dislikes to be so pricked. In this allegory Sir William Harcourt is the porcupine and Sir Edmund Beckett, Q.C., the traveller, and the little encounter took place in one of the committee-rooms of the House of Commons at the end of last week. Sir Edmund had the misfortune to be before a Committee on the vexed question of the Metropolitan Water Companies, of which Sir William Harcourt was Chairman, and, to use a sporting phrase, it was 'long odds' on the Chairman offending or vexing some one in the course of the inquiry. The discussion turned upon the figures and statements prepared by one of the principal witnesses, Mr. Smith, and as these figures had a tendency to prove what Sir Edmund's opponents desired to disprove, they not unnaturally set down Mr. Smith as ignorant, incompetent, and generally untrustworthy. Sir Edmund defended Mr. Smith, and after having spoken—and that very much to the point—for some hours, was interrupted by the genial and always agreeable Home Secretary, who observed that 'he hardly thought that Sir Edmund Beckett could have taken the trouble to read the evidence.' Now, it was Sir Edmund's bounden duty to be familiar with the evidence, and of course he was familiar with it; but that made Sir William Harcourt's sneer none the less offensive. Sir Edmund—the unoffending traveller—however, contented himself with simply rejoining, 'Indeed I have;' whereupon Sir William Harcourt—the fretful porcupine—severely replied, 'Go on, and I expect you will treat us with respect.' As Sir Edmund perceived that he had to deal, not with Sir William Harcourt personally, but with the Chairman of a Parliamentary Committee, he forbore to retort, and succeeded in coming up to the Home Secretary's expectations in the matter. If Sir William Harcourt desires to be 'treated with respect,' however, it would not be by any means a bad idea if he began by showing some sort of respect for other people. The incident suggests the story of the Judge who, having made an unwise observation at which one of the barristers in court half unconsciously shrugged his shoulders, asked whether the learned counsel desired to show contempt for the court. 'Show contempt, my lord! Certainly not,' the counsel replied. 'On the contrary, I am trying to hide my contempt—but it's a very trying business.' Doubtless Sir Edmund did his best to show respect for Sir William Harcourt."

PRESENTATION OF TESTIMONIALS TO MR. G. A. ROBINSON, OF LEICESTER.—A testimonial having recently been presented to Mr. G. A. Robinson, on his resignation of the appointment of joint manager of the Leicester Corporation Gas-Works, by the clerks and workmen employed at the gas office and at the works, the *employés* in the Gas-Fitting and Fittings Manufacture Department, for so many years conducted by Mr. Robinson in conjunction with his brother, Mr. C. S. Robinson, were desirous of presenting him with some token of the respect and esteem which they entertained for him. Accordingly, an address, engrossed on vellum, beautifully and artistically illuminated, and placed in a richly moulded gilt frame, was forwarded to Mr. Robinson for his acceptance, together with a handsome Russia leather cigar-case, with silver fittings and monogram. The address was as follows:—"To George Alfred Robinson, Esq. —Dear Sir,—We, the *employés* of your Gas-Fitting and Fittings Manufacture Department have heard with regret that you retire from the business. We cannot let the event pass without an expression of our sorrow at your leaving us. We could have wished it had been otherwise, for the kindness you have at all times manifested towards us. However, dear Sir, permit us to tender this address as a token of the esteem in which you are held by us, and of our wish for your welfare; and we sincerely trust that you may live many years to enjoy your retirement, knowing, as we do, the useful work for the benefit of others to which you are attached. We also hope the blessing of God may rest upon you, and that when you look at this address it may bring to your remembrance the affection which the subscribers to the same have always felt for you." On the following day Mr. C. T. Hobson, foreman of the department, received from Mr. Robinson a reply to the address, in which he said: "I cannot allow a day to pass without conveying, through you, to the *employés* of the Gas-Fitting and Fittings Manufacture Department my most sincere and hearty thanks for the very handsome illuminated address which was forwarded to me yesterday. Much, however, as I admire the exquisite taste and beauty of its execution, I value far more highly the kindly words of which it is composed, and the kindly feeling which I know dictated its gift. It is most gratifying to feel that in closing my business connection with you all, I carry so many good wishes for the future."

## Register of Patents.

### APPLICATIONS FOR LETTERS PATENT.

2952.—BARBIER, N. F. D., Paris, "Improvements in automatic luminous buoys." July 17, 1880.

2963.—IMRAY, J., Chancery Lane, London, "Improvements in the treatment of gas liquor for the production of ammonium sulphate." A communication. July 19, 1880.

2964.—IMRAY, J., Chancery Lane, London, "Improvements in apparatus for distilling ammoniacal liquor." A communication. July 19, 1880.

### PATENTS WHICH HAVE PASSED THE GREAT SEAL.

289.—LAKE, W. R., Southampton Buildings, London, "Improvements in apparatus for automatically lighting and extinguishing gas." A communication. Jan. 22, 1880.

772.—MATHEWS, C. R., Drury Lane, London, "Improvements in fixing, connecting, and disconnecting gas pendants, brackets, pillar or ground connections, especially adapted for outside reflecting lamps." Feb. 21, 1880.

1478.—MANN, W., Gunnersbury, and WALKER, W. T., Highgate, London, "Improvements in apparatus for the purification of coal gas." April 10, 1880.

1876.—SAMPSON, J. L., North London Iron Works, London, "Improvements in or connected with apparatus for lighting or illuminating with gas." May 7, 1880.

### PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

2177.—HUNTER, A. G., "Improvements in apparatus for the manufacture of gas for illuminating and heating purposes." June 21, 1873.

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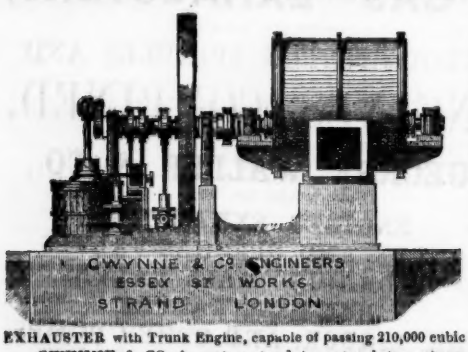


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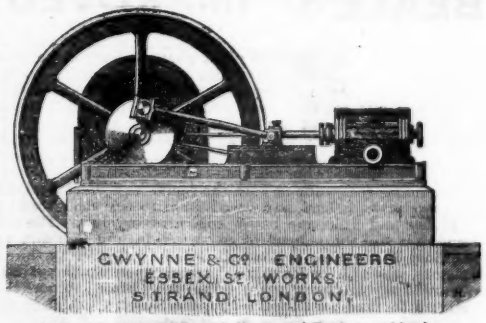


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State size and other particulars and price, to L. WILSON AND SONS, Cornholme, TODMORDEN.

**WANTED, a Second-hand Gas Tank** and Holder, 40 ft. diameter, 14 to 16 ft. deep; in perfect order, complete ready for erection.
Price to include delivery alongside ship, Liverpool or London.
Tenders to be addressed No. 670, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SLEAFORD GAS COMPANY, LIMITED.

**FOR SALE—Single Gasholder, 32 ft. by** 14 ft., Counter-balanced, Connections and all complete, in good condition. Reason for removal, ground wanted.
Particulars to be had of HARRY WIMHURST.

**FOR SALE—Gasholder, 158 ft. by 30½ ft.** in good condition (single, but could be telescoped) to be taken out early next year, and replaced by S. C. & Sons with a Treble Lift. Excellent Guide Framing, consisting of 20 handsome Columns and wrought-iron Girders. May be seen at work at the Gas-Works, Portsea.
Particulars on application to S. CUTLER AND SONS, Millwall, LONDON, E.

**ON SALE—The Cast-Iron Fire Doors,** Mouthpieces, Ascension, H, and Dip Pipes, Hydraulic Mains, &c., belonging to six settings of six retorts; One Station Meter to pass 8000 feet per hour (makers West and Gregson); also nine D-shaped clay retorts, 16 in. by 14 in. by 8 feet.
The above are in capital condition, and can be seen at the Gas-Works, Guildford. No reasonable offer refused.
Further particulars on application to Mr. LONGWORTH, Gas Offices, GUILDFORD.

GAS-WORKS FOR SALE.

**THE Proprietor of a profitably carried** on Gas-Works, in full working order in a Country town, wishes to dispose of same. The investment is a safe one, and will yield an interest of 6 per cent.
Intending purchasers can have full particulars on application to MESSRS. EDMUNDSON AND CO., 19, Great George Street, Westminster, LONDON.

TAR WANTED.

**THE Advertiser is prepared to Purchase** at once, about 1000 Casks of COAL TAR.
State price, delivered on rail, to No. 677, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

STATION-METER FOR SALE.

**THE Gas Committee of the Corporation** of Rochdale offer FOR SALE a STATION-METER, capacity 25,000 cubic feet per hour, 12-in. Connections, Hydraulic Valves and Bye-Pass, and all other necessary Fittings. The Meter is to be removed in consequence of extensions.
Any further information thereon can be had on application to Mr. Paterson.
Gas-Works, June 23, 1880.

GAS PLANT FOR SALE.

**THE Maidstone Gas Company having** enlarged their Works, offer the following Apparatus for Sale in good condition:—
SCRUBBERS.—One Tower Scrubber 30 ft. high by 10 ft. diameter, with Distributor, and partly fitted with Livesey's boards.
CONDENSERS.—One Set of Annular Condensers, consisting of 9 Pipes 17 ft. high, outer diameter 2 ft. 6 in., fitted with 12-in. Valves complete.
ENGINES.—Two 12-Horse Power Horizontal Engines in very good condition.
STATION-METER.—By Milne and Son, in first-class condition, ornamental case, with Valves and Bye-pass complete; to pass 20,000 cubic feet per hour.
HYDRAULIC MAIN.—Six 8 ft. by 18 in. Hydraulic Main D wrought iron; 24 8 ft. 9 in. by 18 in. Hydraulic Main D wrought iron. Nearly new.
RETORTS.—31 Rounds, 15 in. diameter and 9½ ft. long, in two pieces. 2 Ovals, 21 in. by 15 in. and 9 ft. long, in one piece. All of Stourbridge Fire-Clay, and in good condition.
For further particulars and price apply to
JOHN WEST, Engineer and Manager.
Gas Works, Maidstone, April 21, 1880.

GAS PLANT FOR SALE.

**THE Buxton Local Board invite Tenders,** addressed to the Chairman of the Board, for the Purchase of the following, which are thrown out of use in consequence of the erection of new Works:—
28 Mouthpieces, Lids, Screws, and Cross Bars, Stand, and H-Pipes, Hydraulic Main, &c., Condenser, consisting of 16 Vertical Pipes, 18 ft. by 6 ft., with Receiving Main.
Four Purifiers, 8 ft. by 8 ft. by 4 ft. 6 in., Dry Centre-Valve and 8-in. Connections, of recent date.
One Gasholder, 50 ft. diameter 16 ft. deep, Columns and Girders complete.
One Double-Lift Holder, 45 ft. diameter 18 ft. deep, Columns, Girders, and Balance-Weights and Chains, complete.
One Whimster's Exhausting and Washing Machine, with Engine, Bye-pass and Throttle Valves, and Governor for 10,000 ft. per hour, and Egg-end Boiler, 10 ft. by 4 ft., with fittings complete.
Station-Meter to pass 6000 ft. per hour, 8-in. Connections and Bye-pass complete.
[The last three all new within six years.]
Further particulars may be obtained on application to Mr. G. Smedley, Sen., Engineer, Gas Offices, Buxton.
By order,
JOSIAH TAYLOR, Clerk to the Board.
Buxton, July 24, 1880.

TO COLLIERY PROPRIETORS, COAL MERCHANTS, AND OTHERS.

**THE Directors of the Alton Gas and** Coke Company invite TENDERS for the Supply of 750 Tons of Good GAS COALS, to be delivered, carriage paid, on rails at Alton Station (L. & S. W. R. Co.), in quantities as under:—

| | | | |
|---|---|---|---|
| 200 | Tons during the month of | September, | 1880. |
| 250 | " | December | " |
| 200 | " | February, | 1881. |
| 100 | " | March, | " |
| 750 | | | |

The Coal to be of good quality, free from bats, bind, pyrites, and other refuse.
Tenders to state from what colliery the coals are obtained.
Terms of payment, cash at a month.
The Directors do not bind themselves to accept the lowest or any tender.
Tenders to be sent in not later than Monday, Aug. 9, 1880.
H. W. ELLIOTT, Secretary.

**THE Gloucester Gas Company, ceasing** to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—
About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of V-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Exhauster (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse powe with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Three 4-in. Pumps, with cranked Shafting and a pair of Mitre Wheels.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned.
R. MORLAND, Engineer.

**THE Middleton and Tonge Improve-** ment Commissioners are prepared to receive TENDERS for the Purchase of the TAR and AMMONIACAL LIQUOR, together or separate, for One, Two, and Three years, made at their Gas-Works, Tonge, Middleton.
Sealed tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Office of the Clerk, on or before Monday, the 2nd of August, 1880, endorsed "Tender for Tar or Ammoniacal Liquor."
The Commissioners do not bind themselves to accept the highest or any tender.
FREDERICK ENTWISTLE,
Clerk to the Commissioners.
Commissioners Rooms, Tonge, Middleton,
July 16, 1880.

**THE Middleton and Tonge Improvement** Commissioners are prepared to receive TENDERS for the Supply of about 1600 Yards of 12-in. Turned and Bored GAS-MAINS.
Full particulars and specification may be obtained on application to Mr. Hartley, Gas Manager, Middleton.
Tenders, addressed to the Chairman of the Gas Committee, endorsed "Tender for Mains," to be delivered at my Office on or before Aug. 2, 1880.
The Commissioners do not bind themselves to accept the lowest or any tender.
FREDERICK ENTWISTLE,
Clerk to the Commissioners.
Commissioners Clerks Office, Middleton,
near Manchester.

**BOROUGH OF BELFAST CORPORATION GAS-WORKS.**

EXHIBITION OF GAS ENGINES, STOVES, OVENS, BURNERS, AND OTHER APPLIANCES FOR THE ECONOMIC USE OF GAS.

**THE Gas Committee of the Belfast Cor-** poration have determined to hold an EXHIBITION as above stated in the Grain Market, Belfast, to commence on the 16th of August, and to continue open until the 28th of August.
Full particulars may be had from the Manager of the Gas-Works, who will also forward to intending Exhibitors form of application for space and copy of conditions under which the Exhibition is to be held.
By order of the Gas Committee,
JAMES STELFOX, Manager.
Gas-Works, Belfast, July 9, 1880.

WOOD
**TROUGHING**
**For Preserving Service-Pipes.**
*Price from Three-Farthings per Foot.*
In any Lengths.
**THOS. PROUD,**
**Brookfield Works, Icknield St., Birmingham.**

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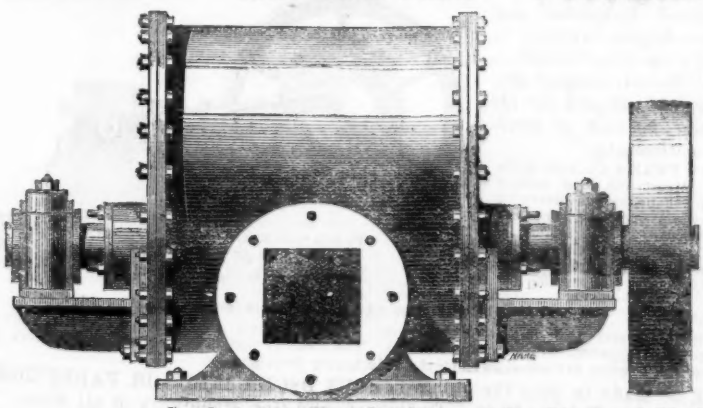

WITH OR WITHOUT
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# ENGINES COMBINED.

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**HYDRAULIC MAIN VALVES,**
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G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

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This day, 12mo, limp cloth, 4s. 6d., or cloth boards 5s. (postage 4d.),

**THE Construction of Gas-Works and** the Manufacture and Distribution of Coal Gas. Originally written by Samuel Hughes, C.E. Sixth Edition. Re-written and much Enlarged by WILLIAM RICHARDS, C.E. With numerous Illustrations.

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GAS, WATER, & STEAM.

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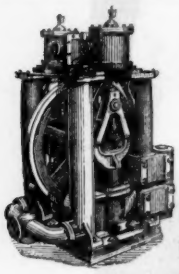
**BRADFORD, YORKSHIRE.**

**John Cameron's Specialities**



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**STEAM-PUMPS**
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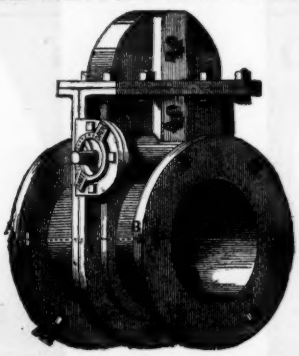
**WITH WROUGHT-IRON PINIONS.**



These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.

In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

ALSO MAKERS OF
J. BEALE'S NEW PATENT GAS EXHAUSTERS, STEAM-ENGINES for Driving Gas Exhausters,
VALVES FOR AMMONIACAL LIQUOR, TAR, &c., IMPROVED BRIDGE VALVES for Regulating the Seal in Hydraulic Mains, so arranged that when once adjusted for the proper overflow they can be closed entirely and opened again without altering the adjustment.
GAS THROTTLE-VALVES, SPECIAL GAS-VALVES with Columns, Gauges, &c.
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# CELEBRATED PATENT GAS-BURNERS,

PREVENTING WASTE AND FLARING.

## THE PATENT "CHRISTIANIA" FLAT-FLAME GOVERNOR BURNER,

**With Various Pattern Burners and Shades, Plain White and Hand-Painted in Various Styles of Decoration, Fern Leaves, Flowers, Birds, &c.**

The "Christiania" Globe.

Mediæval Pattern Burner (Registered).

All Burners and Glass bear my Trade Mark.

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BRONZE MEDAL, PARIS, 1867.

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The "Princess Christiania" Globe, Maidenhair Pattern.

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With 5 cubic feet of Gas, the ordinary Fishtail and Bat's-wing Burners give only a light equal to from SIX to EIGHT SPERMACETI CANDLES, while the PATENT "CHRISTIANIA" FLAT-FLAME BURNER, with self-acting Governor, consuming 5 cubic feet of Gas per hour, gives a light equal to SIXTEEN SPERMACETI CANDLES, or ONE HUNDRED PER CENT. more light for the same quantity of Gas consumed.

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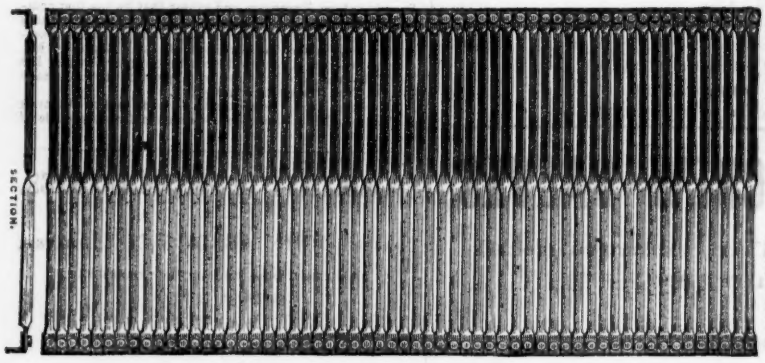


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Are the very best possible as PURIFIER VALVES; leakage impossible, most easy to work, never get out of order or the worse for wear, and can, if desired, be very simply arranged to work the whole or a part of a set of Purifiers in any conceivable order whatever. Have already been erected and approved at the London Gas-Works, Nine Elms; Phœnix Gas-Works, Greenwich; Maidstone, Ipswich, &c.

*Full Particulars on Application.*

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Are the most durable. The sieve bars presenting an inclined plane to the flow of the Gas, offer the least possible resistance, greatly reducing pressure, and permitting contact with every part of the purifying material. Have been supplied to many of the London and Provincial Gas-Works, and give great satisfaction.

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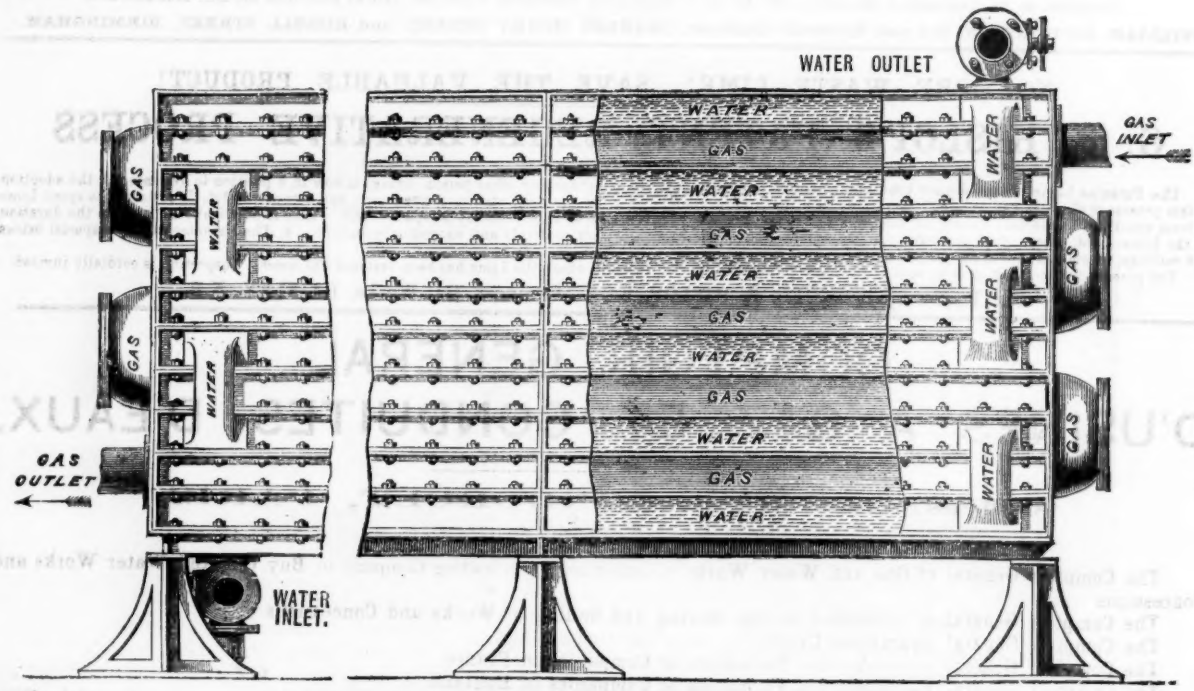
Adopt water as a cooling medium, the respective streams flowing in opposite directions; quantity of water required but small, and being only raised in temperature, is useful for any purpose of the works. The power of Condensers can be regulated at will by the amount of water permitted to pass through. Erected and giving great satisfaction at Brentford, Tunbridge Wells, Maidstone, Buxton, Phœnix Gas-Works, Greenwich; where its advantages may be seen.

Mr. WATES, of Greenwich, has kindly offered to reply to any inquiries addressed to him as to its efficiency.

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[*See* JOURNAL for NOV. 25, 1879.]

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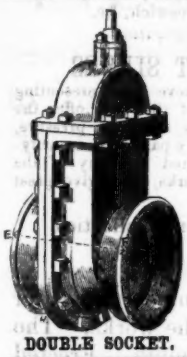
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Begs to inform Engineers and others that he has just completed the extensive and important excavations, amounting to 4000 cubic yards, for the Ramsgate Improvement Commissioners (under the direction of their Engineer, Mr. Valon), whereby a good and abundant supply of water has been obtained, and is now in a position to undertake further work in town or country.
References kindly permitted to be made to MR. WILLIAM A. VALON, C.E., RAMSGATE. Additional testimonials if required.

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SULPHATE PLANT
On the most Modern and Improved Plan.
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ECONOMY IN THE PRODUCTION OF GAS.
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Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,
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**NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!**
# G. R. HISLOP'S PATENT REGENERATIVE PROCESS
Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.
The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

**For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.**

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**The Comptoir Général of Gas and Water Works** is authorized by a leading Company to **Buy Gas and Water Works and Concessions.**
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**M. L. MOSER DULFUS,** the Proprietor of the **Comptoir Général,** has had Twenty years experience in financial affairs, and has a large and influential connection in England, France, and on the Continent.
No Commission or Expenses whatever are charged unless success is secured.

**Le Directeur-Gérant,**
**Bn. L. MOSER DULFUS.**

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*The understated declaration with which we introduced our apparatus when the Argand system was in the full tide of its fame, has been fully borne out by general experience, namely—*

**"THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING; and, 'in actual use,' yields as much light with Common Gas, and more with Cannel Gas, than any Argand System."**

---

CHARLES HUNT, Esq. (President of the British Association of Gas Managers), in his Inaugural Address to the members at their annual meeting, held in London, June, 1880, said: "Rivalry has stimulated into being, for outdoor purposes mainly, Burners of large power, that have fully maintained the superiority of coal gas over the electric light. To Mr. Bray our thanks are due for his development of the FLAT-FLAME BURNER into a lighting medium of a very high order, *and for his vindication of its claims to practical consideration.*"

**The above declaration was received with marked applause by the crowded meeting.**

---

# BIRMINGHAM LAMP TESTS.

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

## ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candles power Lanterns of medium lighting power are being fixed.

*The apparatus used in the above tests were all of our usual medium lighting power class, and the tests showed that we sacrifice a considerable amount of lighting power for general efficiency. The tests further showed that our* 80*-candles* HIGHEST *lighting power burner yielded* 3·51 *candles per foot of gas—the quality being* 16·75 *candles* (3·35 *per foot*) *by the standard—which was a higher result than that yielded by any other flat-flame burner, though copies of our Slit-Unions, enlarged and improved by us Jan.,* 1879, *were used by our competitor; and higher than the* 80*-candles power Argands.*

**NOTE.—The above is the most conclusive answer to the ever-changing and misleading statements which are being made by our competitor, with the object of taking from us the honours we have secured in open contest.**

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Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

[The above Lamps have Meters attached.]

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BRAY'S LANTERNS have been adopted by the Vestry of St. George, Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting.

Also more than 50 Towns and Vestries have adopted them, after a similar competition in most cases; and many private users. In all cases they are a pronounced success.

---

**GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.**

*June,* 1880.

# WET-METER DRUMS.

THE water, which in the "common" meter "seals" the Drum, forms also the base of its measuring chambers. The capacity at the highest water-level is, therefore, different from that at every other. As the water lowers, the capacity enlarges, till the greatest deviation from accuracy allowed by law is attained.

The remedies which have been employed to remove this defect have all, with one exception, added considerable complexity to the parts of the meter external to the Drum, and have left untouched the *cause*, which lies entirely in the Drum itself.

The exception is the SELF-REGULATING DRUM of MESSRS. WARNER AND COWAN, whose invention has made "compensating" arrangements *of every kind* superfluous, and the continued use of Drums, with defects requiring to be so corrected, unnecessary.

The water in the WARNER AND COWAN Meter "seals" the Drum, but does not determine its capacity, water not being the base of the measuring portion.

The presence of the small or inner Drum in one part, and its extractive power over the other, constitute the measuring space an annulus, the inner circle of which encloses, but does not encroach upon, the square (or plane) of the water; hence a fall of the water is not attended by variation in the capacity of the measuring annulus, but only by an increase in the volume of gas between it and the water-line, and as this gas is withdrawn into the small Drum, no enlargement of the annulus, and therefore no change in its capacity, occurs.

## W. & B. COWAN,

(ESTABLISHED 1827),

ORIGINAL LICENSEES AND MANUFACTURERS OF

**WARNER & COWAN'S SELF-REGULATING GAS-METERS.**

CHURCH ST., MILLBANK ST., *LONDON. S.W.* | DUTTON ST., NEW BRIDGE ST., *MANCHESTER.* | BUCCLEUCH ST. WORKS, *EDINBURGH.*

# THE MANN & WALKERS' PATENT SCRUBBER.

**Extensive use.** The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

**Small quantity of Water required.** By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

**Residual Product obtained.** The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

**Illuminating power increased.** The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

**Small amount of power required.** The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

**Beckton Gas-Works.** There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

**Reserve purifying power contained.** There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

**Internal Materials not changed.** The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

**Guarantee** They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

**C. & W. WALKER.**

*8, Finsbury Circus, London, E.C.*

## F. & C. OSLER,

**45, OXFORD STREET, LONDON, W.**

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

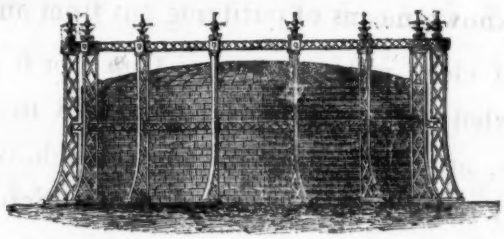
ESTABLISHED 1807.

**MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,**

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES,

**TABLE GLASS OF ALL KINDS.**

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



## THE HORSELEY COMPANY,

**LIMITED,**

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

**6, WESTMINSTER CHAMBERS, VICTORIA STREET,**

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

**GAS OR WATER WORKS;**

ALSO

**MAKERS OF ROOFS, BRIDGES, &c.**

## S. OWENS & CO.,

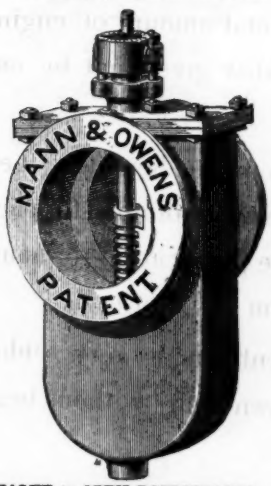
HYDRAULIC, GAS, AND GENERAL ENGINEERS,

**WHITEFRIARS STREET, LONDON, E.C.**

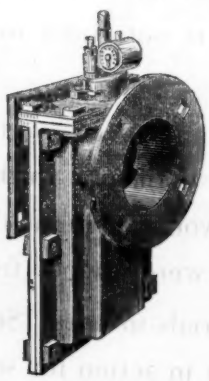
Sole Manufacturers of MANN & OWENS'

**PATENT SCREW & CAM GAS-VALVE,**

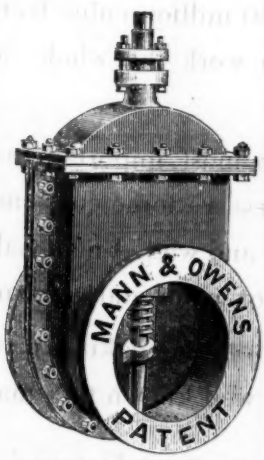
Protected by Royal Letters Patent in England, France, Belgium, & the United States of America.




VALVE to OPEN DOWNWARDS.



BRIDGE-VALVE
for Regulating the Seal of
Hydraulic Mains.




VALVE to OPEN UPWARDS.

The SPECIAL ADVANTAGES of MANN AND OWENS' PATENT VALVE are as follows:—

1. Its non-liability to become set fast through varying temperature or from the deposit from crude gas. 2. It is made absolutely gas-tight by the simple action of a screw and cam. 3. Inconvenience through the breakage of springs or wedges setting fast cannot arise. 4. The face of the Valve is scraped and cleaned of any solid matter at each operation of opening or closing.

**The Valve can be had to work either in a Vertical or Horizontal position.**

**Every Valve is carefully tested under pressure, and warranted perfectly sound and gas-tight.**

**INSTRUCTIONS FOR ORDERING.**

State whether required for above or below ground, if Double Flange or Socket and Spigot Valves are wanted, or with loose Flanged Socket and Spigot pieces.

The Prices include Indicators to show extent to which Valve is open.

**Also makers of PILLAR-VALVES, SELF-ACTING BYE-PASS VALVES, OUTSIDE RACK AND PINION VALVES, HYDRAULIC-MAIN VALVES, DISC-VALVES, &c.**

*Every description of Pumping Apparatus, Hydraulic Lifts, &c., suitable for use in Gas-Works, made to order.*

**PRICES, SIZES, AND FULL PARTICULARS, WITH COMPLETE ILLUSTRATED CATALOGUE, FURNISHED ON APPLICATION.**

## T. NEWBIGGING,

**CONSULTING GAS ENGINEER.**

**5, NORFOLK STREET, MANCHESTER.**

## HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER

**NORWOOD, NORTHENDEN ROAD,**

**SALE, NEAR MANCHESTER.**

## ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

**30, GRACECHURCH STREET, LONDON.**

*Accounts Analysed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.*

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

## JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

**CANNEL COAL FACTOR,**

**30, St. Andrew Square, EDINBURGH.**

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

## THOMAS PROUD,

BROOKFIELD WORKS,

**103, ICKNIELD ST., BIRMINGHAM,**

MANUFACTURER OF

**WOOD GRIDS**

FOR

**PURIFIERS AND SCRUBBERS,**

AND

**GENERAL STEEL AND IRON TOOLS AND MATERIAL USED IN GAS-WORKS.**

**BOX'S PATENT STREET GAS-LAMP**

Has the following good qualities:—

1. No putty or other material is required for glazing. Thus there is no hacking out of old putty on removal of the glass, with the *consequent damage* to the lamp frames. 2. No liability to breakage by unequal expansion of the glass caused by changes of temperature. 3. Any inexperienced workman can glaze the lamp in a few minutes. 4. The system of glazing can be applied to any existing lamp at a trifling cost. 5. It is cheap, strong, and durable. 6. The glass can be easily removed so that the frames can be thoroughly painted inside and out.

The lamp may be supplied fitted with clear opal or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing lamps to this system can be supplied at moderate prices and a small charge for royalty. Licences granted on the most reasonable terms. For further particulars apply to the Patentee,

W. W. BOX,

Gas-Works, Crayford, Kent.

## RETORT BOLTS,

AND ALL KINDS OF

**BOLTS AND NUTS,**

SUITABLE FOR

## GAS-WORKS,

SUPPLIED BY

**JOHN STANSFELD,**

Bolt & Nut Manufacturer,

**ALFRED ST., BOAR LANE, LEEDS.**

## ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

TREES BOGHEAD,

SHOTTS BOGHEAD,

And all the first-class Scotch Cannels.

*Prices and Analyses on application.*

## HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

**WANTED, by Samuel Thompson & Co.,** Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

GAS COAL.

**POPE & PEARSON, LIMITED,** have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

GAS COAL.

**THE MIRFIELD COAL COMPANY** are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67-*candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·48.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON. London Agent: Mr. F. J. LEE SMITH, Bromley, KENT.

## GAS COAL.

**THE Tawd Vale Colliery Company,** Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete Analysis, on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; gas per ton, 10,300 cubic feet; illuminating power, 18·39 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

**BIRTLEY IRON WORKS,**
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

THE

## SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

## GAS AND WATER PIPES.

WILLIAM MacLEOD & Co.,

30, ST. ENOCH SQUARE, GLASGOW.

## CAST-IRON GAS AND WATER PIPES.

DELIVERY F.O.B., GLASGOW.

*Prices on application.*

## FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

## WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES.

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

## GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

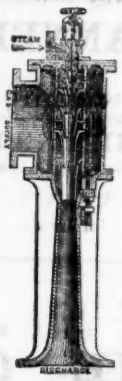
STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the AUTHOR; or at the Office of the "JOURNAL OF GAS LIGHTING."

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

35a, GREAT GEORGE STREET, WESTMINSTER, S.W.




## KÖRTING'S STEAM-JET EXHAUSTER,

IMPROVED CLELAND'S PATENT.

UPWARDS OF 400 IN USE.

CLELAND'S PATENT SLOW-SPEED CONDENSER, AND CLELAND'S PATENT STEAM SCRUBBER.

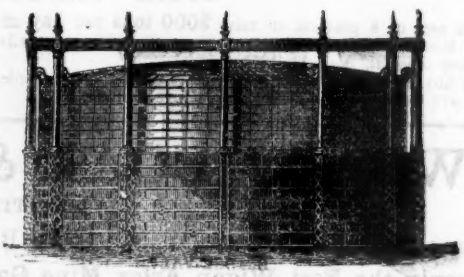
*FOR PARTICULARS, APPLY TO*

## KÖRTING BROS.,

17, LANCASTER AVENUE, MANCHESTER,

OR TO

GERALD J. TUPP, Creek Engine-Works,
Middle Mall, Hammersmith, London, W.



## HENRY BALFOUR & CO.,

ENGINEERS, IRONFOUNDERS, AND GAS APPARATUS MAKERS,

39, FINSBURY CIRCUS, LONDON, E.C.

Works: DURIE FOUNDRY, LEVEN, FIFE, N.B.

MANUFACTURERS OF

GASHOLDERS, SINGLE OR TELESCOPE, WITH OR WITHOUT COUNTERBALANCE GEAR; TANKS, CAST & WROUGHT IRON.

BOILERS, CONDENSERS, CRANES, EXHAUSTERS AND ENGINES,

GIRDERS (Cast and Wrought Iron), IRON PIPES, PUMPS, PURIFIERS, RETORTS & FITTINGS,

ROOFS, SCRUBBERS, SHAFTING, VALVES, WASHERS.

ANDERSON'S PATENTED INVENTIONS, VIZ.—

FOUR-WAY BYE-PASS VALVES, ENGINES AND EXHAUSTERS, REVOLVING BRUSH SCRUBBERS, GAS-WASHERS, FUEL-MAKING MACHINES, GOVERNORS, &c.

H. B. & Co. undertake Contracts for the Supply and Erection of Gas-Works, either for Towns or Mansions, or the Remodelling of existing Works.

SHIPPING ORDERS receive special attention.

H. B. & Co. having had large experience in this Department, undertake to ship, f.o.b., properly packed and marked for export.

ESTIMATES AND DESIGNS ON APPLICATION.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

# J. E. WILLIAMS & CO.,

SOLE MANUFACTURERS OF THE

## SPECIAL METALLIC OXIDE PAINT,

Largely used by Gas Companies, Corporations, Railway Companies, Ironfounders, and Machinists.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

It has the following qualifications and properties:—

Effectually prevents and arrests corrosion.
Has a fine gloss, and is very durable.
Does not require driers like other paints.
Protects iron from action of water,

Is not affected by sulphuretted hydrogen.
Forms a very hard, tough (not brittle) surface.
Will not crack, blister, or scale.
Is not affected by extremes of temperature.

Covers nearly double the area of other paints. (7 gallons or 1 cwt. will cover 1211 square yards of ironwork.)
Is cheaper and more economical than any other.

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

# WARNER'S RETORT-HOUSE MACHINERY.

[*As Illustrated and Described in the* JOURNAL *for May* 4.]

Communications to be addressed to

W. J. WARNER, GAS-WORKS, SOUTH SHIELDS.

# ALDWARKE MAIN AND CAR HOUSE COLLIERIES,

Near ROTHERHAM.

## JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD.

PROPRIETORS.

The Aldwarke Main Brights is a first-class gas-making and coking Coal, yielding by analysis 12,600 feet of 19-candle gas per ton, and giving "Weight of illuminating matter in lbs. of sperm, 820·80." It is very free from impurities and foreign matter.

*Copies of Analyses made by Gas Companies who have used it will be forwarded and Samples sent on application.*

# THE LOCHORE & CAPLEDRAE CANNEL COAL COMPANY,

Limited,

Beg to intimate that the development of their Mines is progressing favourably, and that they are now in a position to supply their famous Cannels.

*Quotations and full Analyses will be supplied on application addressed to the Company,*

LOCHGELLY, FIFESHIRE, N.B.

Abstract of Analyses made by Dr. WALLACE, Gas Analyst for the City of Glasgow.

| | Cubic Feet per Ton. | | Illuminating Power. | | Equivalent of a Ten in Sperm. |
|---|---|---|---|---|---|
| Plessis Boghead | 13,165 | .... | 36·16 | .... | 1632 |
| Brown Capledrae | 12,210 | .... | 38·46 | .... | 1610 |

# GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

# HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

# THE WIGAN COAL & IRON COMPANY,

LIMITED.

MIDLAND DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: A. C. SCRIVENER,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

# THE BLAINSCOUGH HALL COLLIERY COMPANY.

## BEST WIGAN ARLEY GAS COAL.

Yielding (as per analysis) 11,970 cubic feet of 16·39 candle gas per ton. Copies of analyses and testimonials from **Gas Companies and Managers**, who have used the Coal in large quantities for several years, will be forwarded on application.

Postal address, **CHORLEY**, Lancashire.

Waggon address, **COPPULL SIDING**, near **WIGAN**, London and North-Western Railway.

SAMPLE QUANTITIES SENT ON APPLICATION.

# CROLL'S
# DRY GAS-METERS,

PRIZE MEDALS. (INVENTED & PATENTED IN 1844,) PRIZE MEDALS.

LONDON, 1851; NEW YORK, 1853; PARIS, 1855. COMBINING ALL THE LATEST IMPROVEMENTS, LONDON, 1862; DUBLIN, 1865 PARIS, 1867.

MANUFACTURED ONLY BY

## THE GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON, N.E.

SOLE AGENT FOR SCOTLAND: JAMES KEITH, EDINBURGH AND ARBROATH.

## CIRCULAR TO GAS COMPANIES AND OTHERS.

*Stourbridge, Jan.*, 1880.

DEAR SIRS,—As the time for ordering stock for your general requirements for this year is approaching, we beg to call your attention to the various articles of our manufacture, and to solicit your early commands.

**Fire-Clay Gas-Retorts.**—As some of our friends appear to prefer these *machine made*, we have arranged to supply machine-made Retorts at same price as hand-made ones. At the same time, although it is to our advantage to supply machine-made, we do not recommend them, for the reason stated to you in our Circular of November, 1878. We have a very large stock of Retorts, all in good condition, and of such an assortment that we could supply any size on receipt of order.

**Fire-Bricks and Fire-Clay Settings of all Shapes and Sizes.**—We have a large and varied stock, or could make to special design at short notice.

**Staffordshire Blue Bricks and Paving Bricks.**—We shall be glad to submit prices and samples of these on hearing from you, with specification, and we venture to say our brand in these goods is unsurpassed. Hard Blue Paving Quarries make the best kind of Pavement for Retort-Houses, &c.

**Coloured and White Glazed Bricks, Porcelain Baths, Kitchen Sinks, Corner Sinks, &c.**, we are making a great speciality of, and have no hesitation in saying that our glazed goods are unequalled for soundness of manufacture and purity of colour.

**Earthenware Drain-Pipes, Cast-Iron Pipes, Wrought-Iron Tubing.**—We should be glad of an opportunity of quoting you for these when you are in the market.

**Lime, Cement, Plaster of Paris.**—Our Lime Kilns at Brettell Lane are now in full operation, and we are in a position to supply any quantity of pure Lime manufactured only from the Earl of Dudley's best Limestone Beds. Our Cements and Plaster of Paris will withstand any required test.

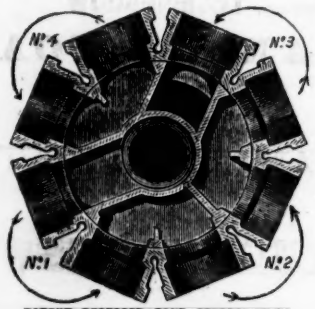
**References and Testimonials.**—We can furnish you with any number of these; and may mention that during the last thirty-five years we supplied most of the Gas-Works in the United Kingdom and Abroad, and that we have held contracts from Her Majesty's Government for more than Twenty years consecutively.

Awaiting your esteemed favours,

We remain, Dear Sirs, your obedient servants,

HARRIS & PEARSON.

*Note.*—We shall be pleased to furnish Drawings and Specifications, if desired, and shall be most happy to see you or any of your Engineers here at any time; or, if you would like to see any of our representatives or ourselves at your Works, shall be glad to wait upon you by appointment.

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*Sectional Plan.*

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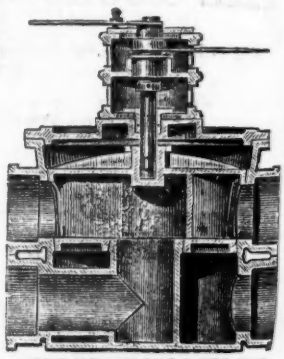

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Invite the attention of Gas Companies, Corporations, and others to their

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Which are so constructed that neither putty nor other materials are required to secure the glass. No hacking out of old putty, which frequently destroys the frames. A new pane of glass can be inserted in two or three minutes by any inexperienced person, the glass being secured by a hinged flap and turn button.

PRICE, with Opaline Reflecting Top, 12s.; with Fluted Glass Top, 10s. 6d.
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By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

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For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

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